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稀土磁性功能薄膜材料的研究现状

夏宁

摘 要：稀土磁性功能薄膜材料由于具有优异的性能和巨大的需求潜力，将在很多领域中发挥重要的作用。本文对各种稀土磁性功能薄膜材料进行了较为系统的综述，重点评述了稀土永磁薄膜、稀土磁光薄膜、稀土磁泡薄膜和稀土磁致伸缩薄膜等稀土磁性功能薄膜材料的研究状况和最新进展。文中最后指出了稀土磁性功能薄膜材料存在的问题，并展望了它的应用前景。

关键词：稀土；磁性；功能薄膜；研究现状；

The present research of the Reae Earths Magnetism function thin films material

Abstract：The Reae Earths magnetism thin films material will develop an important role in many fields because of having the excellent function and huge need potential．in this paper. a brief review on various functional thin films was introduced with the emphasis on the recent research of different Magnetism Function thin films.Finally,the existing problems of The Reae Earths magnetism thin films were pointed out and the developing prospect of thaws described．

Key words: Sparse soil; Magnetism ； Function thin films;present research

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铈掺杂对超细 LaMnO3+λ 三效催化性能的影响

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摘 要：以 Ce(CO3)2、La2O3 和 Mn(NO3)2 为原料，用“溶胶-凝胶”法结合“超临界干燥技术”，将铈引入超细 LaMnO3+λ 气凝胶中。用 TG-DTA、XRD、TEM、FT-IR 等手段对样品进行表征；并用 CO 与 NO 的反应检测铈掺杂对超细 LaMnO3+λ 催化活性的影响。结果显示：(1)260℃时，制得 Ce-La-Mn 气凝胶为疏松、具有较好分散性的棕色粉末，呈絮团状，由大量直径小于 10nm 的球形小颗粒集合而成；(2)850℃热处理后，Ce-La-Mn 气凝胶的主要成分为 LaMnO3 和 CeO2，结晶度提高，出现烧结，颗粒粒径仍小于 20nm；(3)铈掺杂，改善了氧化还原催化的气氛条件，影响到钙钛矿晶格氧的迁移，提高了超细 LaMnO3+λ 催化活性。

关键词：纳米;LaMnO3+λ; 超临界干燥; 气凝胶；稀土

The influence of catalysis activity LaMnO3+λ Ce-doped

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Abstract: Using $Ce(CO_3)_2$, La_2O_3 and $Mn(NO_3)_2$ as main material to dope the Ce into $LaMnO_{3+\lambda}$ aerogel by sol-gel method and vacuum drying method. Characterize by TG-DTA, TEM, XRD, FT-IR, and so on. The result show:

(1) At 260℃, the Ce-La-Mn aerogel,which is flocculate, is brown loose powder with well dispersibility. The aerogel ismade up of a mass of global grains whose diameters are less than 10nm.

(2)After treated at 850℃, the main components of the Ce-La-Mn aerogel are $LaMnO_3$ and CeO_2. The degree of crystallinity is advanced. The phenomena of sintering come forth. And the diameters also are less than 20nm.

(3) Ce-doped improved the ambi-condition of redox catalysis, effected the migration of the perovskite oxygen lattice and advanced the catalysis activity of nano-$LaMnO_{3+\lambda}$.

Keywords: nanometer; $LaMnO_{3+\lambda}$; supercritical drying; aerogel; rare earth

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White Upconversion Luminescence in Re3+: Gd3Ga5O12 Nanocrystals

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Abstract：Rare-earth ions doped Gd3Ga5O12 nanocrystals, which emit white up-converted luminescence upon near-infrared excitation, have been prepared by a propellant combustion synthesis method and their up-converted luminescence properties were systematically investigated in this paper. XRD, FT-IR, SEM, TEM, and up-converted photoluminescence were used to characterize the synthesized phosphors. A white light generation was observed in the Yb3+/Er3+/Tm3+ tri-doped Gd3Ga5O12 nanocrystals when the Yb3+, Er3+and Tm3+ ions are directly incorporated in the host lattice, and the calculated color coordinates is (0.28, 0.33) under the excitation at 974.2 nm. The energy transfer from Yb3+ to Er3+and Tm3+ ions can occur simultaneously in the synthesized Gd3Ga5O12 nanocrystals. The up-conversion (UC) mechanisms were proposed experimental. The bright white luminescent nanocrystals may have potential application in the field of lighting, displays and photonics.

Keywords：Photoluminescence Garnet Combustion

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稀土配合物纳米微晶/高分子纳米纤维的复合材料的制备及光学性质的表征

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摘 要：本文将稀土配合物 Eu(DBM)3・H2O、Eu(DBM)4・CPC 纳米微晶复合于聚乙烯基吡咯烷酮溶液中，通过静电纺丝技术制备得到具有较强荧光特性的无机/高分子复合纳米发光纤维。研究结果表明：聚乙烯基吡咯烷酮是稀土配合物纳米微晶的良好复合基质，能为其提供稳定的化学环境；所获得的含有稀土配合物的纳米发光纤维的发光强度、发光寿命均高于本体稀土配合物和稀土配合物纳米微晶，这一探索将在荧光、激光以及磁性等方面具有很好的应用前景。

关键词：稀土配合物，纳米纤维，高分子，荧光性质

Abstract:In this paper, $Eu(DBM)_3 \cdot H_2O$ and $Eu(DBM)_4 \cdot CPC$ microparticles were compounded into polymer, we gained enhanced luminescent nanofibers by electrospinning. The result indicated PVP played a dramatic role both in stabilizing the nanostructure and in increasing relative luminescent intensities of the hypersensitive transitions ($^5D_0 \rightarrow {}^7F_2$ for Eu, and $^5D_4 \rightarrow {}^7F_5$ for Tb). Photoluminescence measurements indicated that nanofibers showed high intensity. The lifetime of the nanofibers also lengthened. The composite nanofibers embody a class of new materials that present the characteristics of complexes, making them applicable in a wide range new technologies, such as flexible large area displays and light－emitting devices.

Keywords: rare earth complex; nanofibers;polymer; fluorescence property

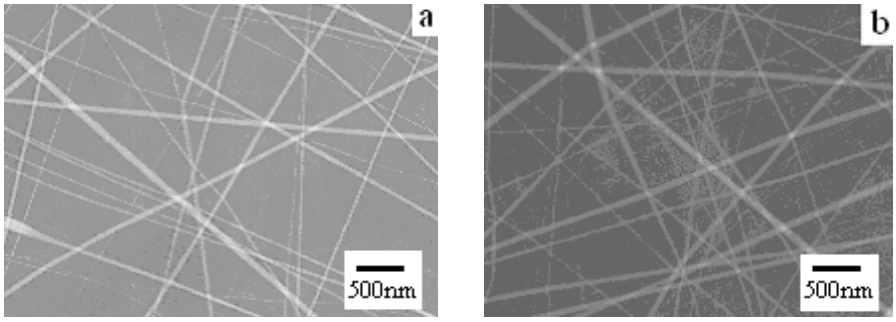


Figure1 TEM photograph of 7wt％ nanofibers containing (a)$Eu(DBM)_3 \cdot H_2O$ and (b)$Eu(DBM)_4 \cdot CPC$ nanocrystallines

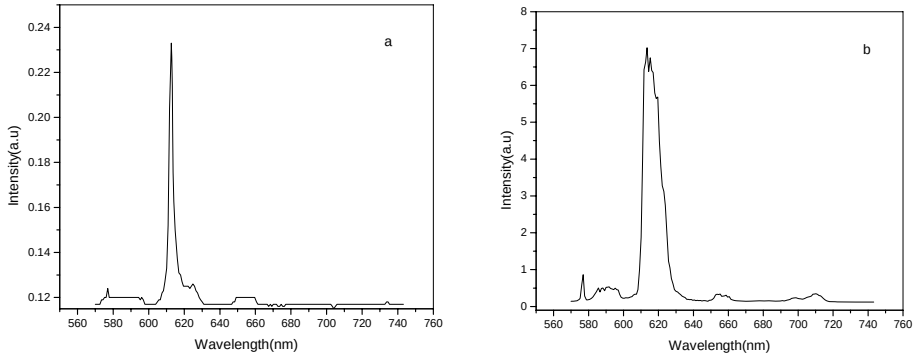


Figure 2 Emission spectra of (a)$Eu(DBM)_3 \cdot H_2O$ nanoparticle and (b) nanofiber

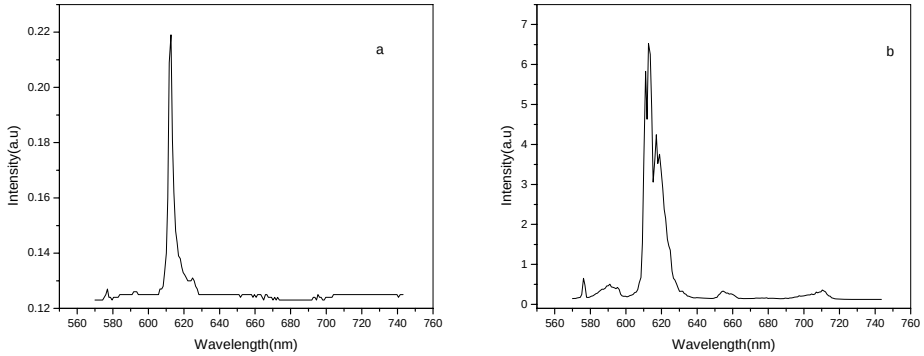


Figure3 Emission spectra of (a) $Eu(DBM)_4 \cdot$CPC powder and (b)nanofiber

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稀土改性固体超强酸催化剂 SO42-/TiO2-La2O3 的制备及其催化性能研究

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摘 要：制备了稀土改性固体超强酸催化剂 SO42-/TiO2-La2O3 环境友好催化剂，并以丁酸丁酯的合成作为探针反应，系统考察了原料摩尔比 n(La3+): n(Ti4+)，硫酸浸渍时间，焙烧温度，活化时间等制备条件对催化剂 SO42-/TiO2-La2O3 催化活性的影响。实验表明：制备催化剂的适宜条件为原料摩尔比 n(La3+): n(Ti4+)=1: 34，硫酸浸渍浓度为 0.8 mol·L-1, 硫酸浸渍时间为 24 h, 焙烧温度为 480 ℃，活化时间 3 h。利用优化条件下制备的催化剂 SO42-/TiO2-La2O3 催化合成缩醛（酮），在醛/酮与二元醇（乙二醇，1，2-丙二醇）的投料摩尔比为 1:1.5，催化剂的用量占反应物总投料质量的 0.5%，反应时间为 1 h 条件下，10 种缩醛（酮）的产率在 41.4%~95.8%之间。

关键词：SO42-/TiO2-La2O3，稀土，固体超强酸，催化

Preparation and Catalytic Activity of SO_4^{2-}/TiO_2-La_2O_3

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Abstract SO_4^{2-}/TiO_2-La_2O_3, a novel solid superacid, has been prepared and its catalytic activities at different synthetic conditions were discussed with esterification of n-butanoic acid and n-butyl alcohol as probing reaction. The optimum conditions have also been found, that is, mole ratio of $n(La^{3+})$: $n(Ti^{4+})$ is 1: 34, the soaked consistency of H_2SO_4 is 0.8 mol·L^{-1}, the soaked time of H_2SO_4 is 24 h, the calcining temperature is 480°C, the calcining time is 3 h. Then it was applied in the catalytic synthesis of ten important ketals and acetals as catalyst and revealed high catalytic activity. Under these conditions on which the molar ratio of aldehyde/ketone to glycol is 1:1.5, the mass ratio of the catalyst used in the reactants is 0.5 %, and the reaction time is 1.0 h, the yields of ketals and acetals can reach 41.4%~95.8%.

Keywords SO_4^{2-}/TiO_2-La_2O_3, rare earth, solid superacid, catalysis

氧化铈熔盐电解过程预还原机理的研究

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摘 要： 本文在物料的差热—热重分析的基础上,配合粉末物料的高温反应实验以及产物的 X 射线衍射结构分析，确定了氧化铈熔盐电解过程电解前氧化铈还原为三价铈化合物的预还原机理。预还原的化学反应式为：

2CeO2 + C + CeF3 == 3CeOF + CO

关键词：CeO2 , 熔盐电解，预还原， 机理

Research on Pre-Reduction Mechanism of Cerium Oxidation in Fused-Salt Electrolysis Process

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Abstract: Based on DTA-TG analysis of as-prepared powers and and X-ray diffraction analysis on products after high-temperature reaction, pre-reduction mechanism of cerium oxidation to trivalence compounds in prior fused-salt electrolysis processing were determinated . The chemical process follows this equation :

2CeO2 + C + CeF3 == 3CeOF + CO

Keyword: CeO_2 , fuse-salt electrolysis, pre-reduction, mechanism

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二维铈配合物[Ce(Hpdtc)(H2O)3]·H2O 的合成与晶体结构

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摘 要：杂环芳香多羧酸配体，比如吡啶二甲酸、吡啶三甲酸等因为存在N和O配位原子被广泛用于构筑金属有机配合物框架结构1,2。对比吡啶二甲酸、三甲酸，吡啶四甲酸具有更丰富的配位基团，更有助于构筑具有丰富配位模式的框架结构。我们实验组以吡啶-2,3,5,6-四甲酸为配体已经合成了一些具有新型结构的一维，二维和三维的配位聚合物。本文中由Hpdtc3-桥联的二维Ce(III)配合物[Ce(Hpdtc)(H2O)3]·H2O是由水热方法得到的。X-射线单晶衍射分析表明该配合物属于三斜晶系，P-1空间群。晶胞参数：a = 8.4701(17) Å, b = 8.9690(18) Å, c =9.4258(19) Å, α = 95.70(3)°, β = 115.11(3)°, γ = 95.39(3)°。该配合物中，吡啶四甲酸配体没有完全的去质子化而是以Hpdtc3-形式桥联Ce(III)形成二维结构的配位聚合物。如图1所示，金属Ce采取九配位，处于变形单帽四方反棱柱的配位环境中(图2)。吡啶-2,3,5,6-四甲酸配体又进一步的桥联金属离子使该配合物构筑成无限延展的二维结构(图3)。

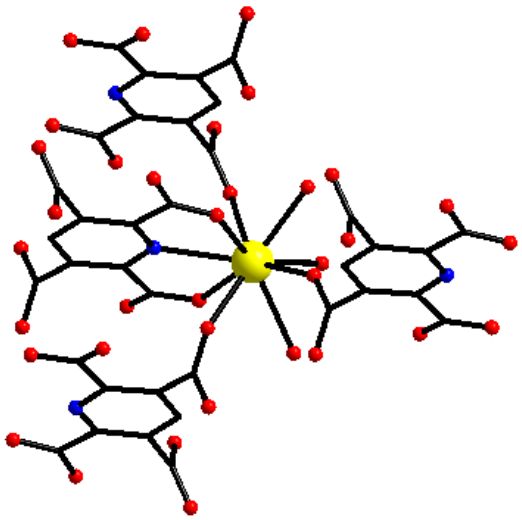


Figure 1. The coordination environment of Ce(III). H atoms are not shown for clarity.

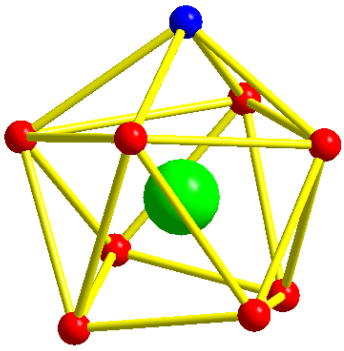


Figure 2. The coordination polyhedron of Ce(III).

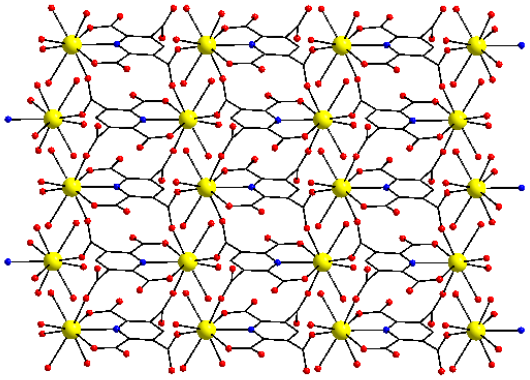


Figure 3. The 2D structure of complex.

关键词：吡啶-2,3,5,6-四甲酸；二维结构，铈配合物

Synthesis and crystal structure for a 2D Ce(III) complex $[Ce(Hpdtc)(H_2O)_3]\cdot H_2O$

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Abstract: Heterocyclic aromatic mulcarboxylic acid ligands such as pyridine-dicarboxylic acids and pyridine-tricarboxylic acids etc. are of intense interest to be used constructing metal-organic frameworks (MOFs) due to existence of both N and O atoms.[1-3] Compared with di- or tri-pyridinecarboxylic acids, pyridine-2,3,5,6-tetracarboxylic acid (H_4pdtc) has more rich coordination groups, which is possibly much easier to construct high dimensional complexes than them. H_4pdtc complexes might exhibit interesting structural chemistry, they are be incorporated into preparing new types of MOFs with open structures to generate rigid one-, two-, and three-dimensional (1-D, 2-D and 3-D) coordination polymers by our team.

In this paper, a pyridine-2,3,5,6-tetracarboxylate ($Hpdtc^{3-}$) bridged 2D Ce(III) complex, $[Ce(Hpdtc)(H_2O)_3]\cdot H_2O$, has been synthesized under hydrothermal conditions. X-ray single crystal diffraction analysis indicates that the complex belongs to Triclinic crystal system, *P*-1 space group with a = 8.4701(17) Å, b = 8.9690(18) Å, c = 9.4258(19) Å, α = 95.70(3)°, β = 115.11(3)°, γ = 95.39(3)°.

新型烧绿石型氧化物 CdYFeWO7 合成及磁学性能

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摘 要：本文采用固相合成法制备出立方相烧绿石结构的CdYFeWO7化合物，利用从头算方法解析其结构。研究结果表明CdYFeWO7化合物采用Fd-3m空间群，其48f 和8b位置存在氧空穴，几何失挫的子晶格导致了铁与钨原子无序占据。电荷分布分析也表明氧位置存在缺陷，因此该化合物是非化学计量比的，其分子式为CdYFeW0.982O6.94。磁学研究表明铁离子处于三价高自旋态，持续到约5k的居里-外斯顺磁态以及零场冷却与加场冷却曲线的重合现象暗示了该化合物的基态为自旋液体而不是自旋玻璃。

关键词：失挫磁体，结构解析，磁学性能

STRUCTURE AND MAGNETIC PROPERTIES OF NEW COMPOUNDS CdYFeWO7

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Abstract：The solid solutions CdYFeWO7 which are cubic pyrochlores of the type A2B2O7 have been prepared and the structure determined using Ab initio. Rietvled refinement of using the powder XRD data shows the CdYFeWO7 adopts the cubic (Fd-3m) structure, while oxides crystallize in a defect-pyrochlore structure where both O (48f) and O'(8b)sites are partially occupied, the frustrated cations sublattice precludes a long range ordering of Fe/W in the pyrochlore structure. The charge distribution analysis also suggests incomplete occupation of the different oxygen sites, thus the compound is non-stoichiometric, with the formula CdYFeW0.982O6.94.Magnetic measurements were carried out to find that Fe ions are in the high spin trivalent state. Curie Weiss paramagnetism down to ~5k and the characteristic superposition between FC and ZFC likely suggested a spin liquid rather than a spin glass state.

Keywords: frustrated magnetic materials; structure determination; magnetic properties;

具有孔洞的三维 Yb(Ⅲ)配位聚合物的合成与晶体结构

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摘 要：羧酸类桥联配体的配位聚合物在催化、光、磁等方面都具有潜在的应用前景[1-3]，所以对其的设计合成、结构与性能的研究一直是人们热衷的研究领域。但是，已报导的吡嗪羧酸类配体的配位聚合物大多数是过渡金属配合物，其镧系金属配合物的研究还较少。本文用2,3,5,6-吡嗪四甲酸和硝酸镱反应，合成了一种具有孔洞的三维配合物[Yb2(pztc)1.5(H2O)6]·7H2O（H4pztc = 2,3,5,6-吡嗪四甲酸），并通过X－射线单晶衍射测定了它的结构，结果表明，该配合物是一个具有孔洞的三维结构的聚合物，属于单斜晶系，空间群为P2(1)/c，晶胞参数：a = 8.954(2) Å, b = 22.026(5) Å, c = 13.640(3) Å; β = 95.570(4)°。如图1所示，在结构单元中有两种配位环境的Yb：Yb1和Yb2，中心原子Yb1为九配位，与三个三齿螯合的pztc4-配位，从而形成了三帽三棱柱构型；中心原子Yb2为八配位，由两个羧基O原子和六个配位水分子完成了Yb2中心的四方反棱柱构型。以该结构为基本单元进一步组装成了具有孔洞的三维结构（见图2）。

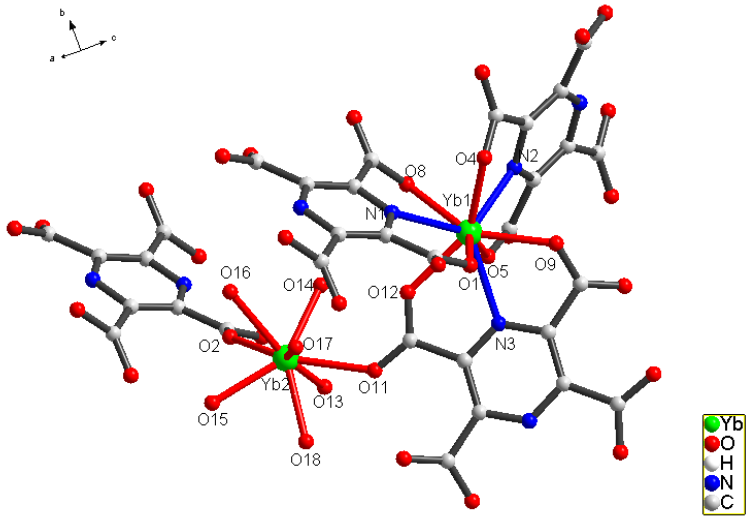


Fig. 1 The coordination environment for Yb(Ⅲ) ion in the complex

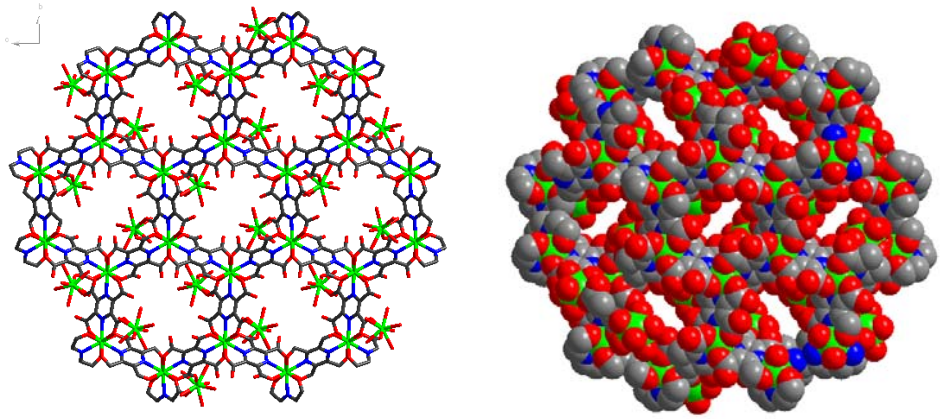


Fig. 2 The space-filling diagram of the cavity

Synthesis and crystal structure of 3D Yb(Ⅲ) coordination polymer with cavities

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Abstract: The design and construction of coordination polymers have been still going on due to their potential applications in the areas of catalysis, luminescence and magnetism[1-3]. However, most of them are transition metal-based coordination polymers, by contrast, the reports on the lanthanide-based coordination polymers remain few. Herein, we have synthesized a 3D polymer $[Yb_2(pztc)_{1.5}(H_2O)_6]\cdot 7H_2O$ (H_4pztc = pyrazine-2,3,5,6-tetracarboxylic acid). Single-crystal X-ray diffraction indicates that the structure of this complex belongs to monoclinic system, *P*2(1)/c space group with a = 8.954(2) Å, b = 22.026(5) Å, c = 13.640(3) Å; β = 95.570(4)°. Yb1 is nine-coordinated and Yb2 is eight-coordinated. Three tridentate $pztc^{4-}$ ligands chelated to one Yb1 center, thus six carboxylate oxgyen atoms and three N atoms finish the nine-coordinated environment of Yb1 which conforms most closely to a tricapped trigonal prism. The Yb2 atom is eight-coordinated with two carboxylate oxygen atoms from two different $pztc^{4-}$ units, and six oxygen atoms from water, and the coordination geometry for eight-coordinated Yb2 can be described as an antisquare prism (Fig. 1). The unit was further assembled into a 3D structure polymer with cavities (Fig. 2).

具有孔洞结构的三维钆配合物{[Gd2(pztc)(ox)(H2O)5]·6.5H2O}n 的合成与晶体结构

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摘 要：设计和合成高维金属有机配合物吸引了众多研究人员的注意，这不光是因为这些配合物具有新奇的结构，更是因为它们在催化、吸附、离子交换、电、磁等领域所具有潜在的应用前景[1]。然而，以往人们的目光主要集中在过渡金属形成的配合物上。镧系金属易形成高配位数的配合物，吡嗪羧酸类配体是配位方式多样化的多功能配体，二者有望合成具有独特结构的配合物。然而到目前为止，文献中报道的吡嗪羧酸类配体和镧系金属形成的配合物很少[2-5]，尤其吡嗪四甲酸和镧系金属形成的配合物尚未见报道。

本文合成了新型三维高对称性配合物{[Gd2(pztc)(ox)(H2O)5]·6.5H2O}n (pztc = 2,3,5,6-吡嗪四甲酸根, ox =草酸根)，并测定了其晶体结构。单晶衍射分析表明该配合物为三斜晶系、P-1空间群，晶胞参数：a = 8.6049(17) Å, b = 10.028(2) Å, c = 13.450(3) Å, α = 94.72(3)°, β = 90.14(3)°, γ = 101.60(3)°。钆的配位结构如图1所示。配合物中有两个配位环境不同的Gd(III)：Gd1和Gd2，Gd1为九配位，为扭曲的三帽三棱柱构型，Gd1与三个pztc4-、一个双齿配体ox和一个H2O配位，三个pztc4-分别表现为三齿、双齿和单齿配位模式；Gd2为八配位，与两个单齿配体pztc4-、一个双齿配体ox和四个H2O配位，为四方反棱柱构型。Gd(III)间由pztc4-和ox桥联，从而进一步组装成高度有序具有孔洞的三位网状结构(图2)。

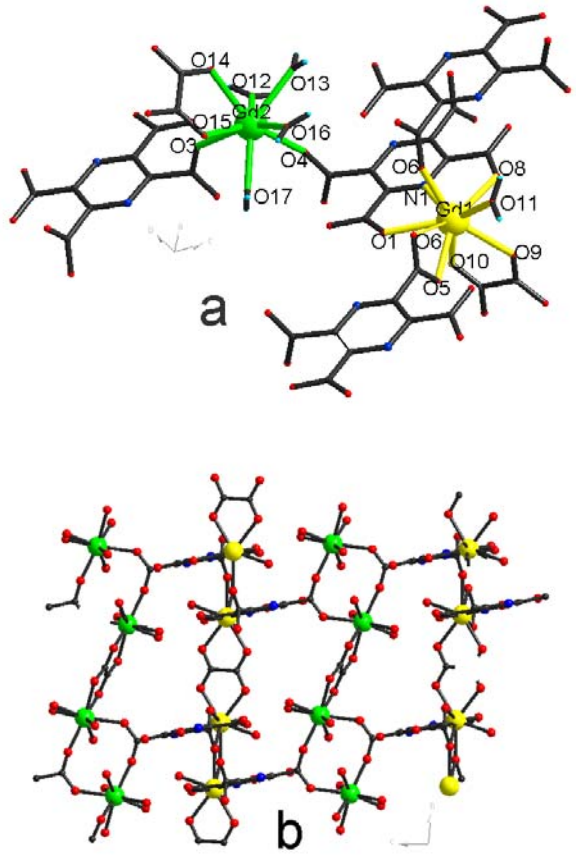


Figure1. The coordination environment of Gd(Ⅲ) (a) and 2D coordination layers viewed along b axis (b)

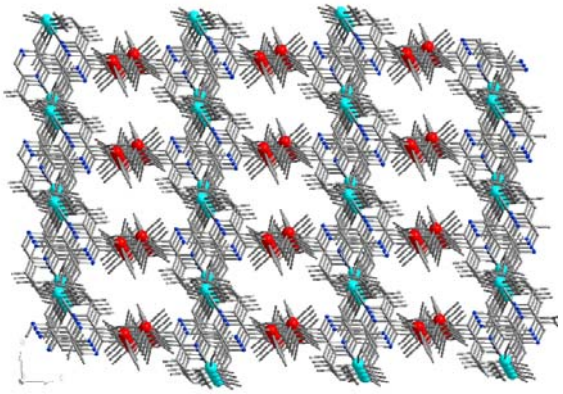


Figure2. Perspective view of the 3D network of the complex, free water molecules are omitted for clarity.

关键词：吡嗪2,3,5,6-四甲酸；钆配合物；孔洞。

Synthesis and crystal structure of 3D Gd(Ⅲ) coordination polymer with cavities

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Abstract: Synthesis of high dimensional metal organic frameworks (MOFs) structures has attracted extensive research interests, not only because of their fascinating structures, but also their potential applications in catalysis, molecular adsorption, ion exchange, electronic and magnetic materials areas.[1] However, much of the work has so far been focused on the complexes containing transition metals. Novel complexes containing pyrazine multicarboxylic acids and lanthanides are desired to be obtained because of the high coordination numbers of lanthanides and the rich coordination modes of the ligands. However, only a few of this kind of complexes have been reported and to our best knowledge, lanthanide complexes of pyrazine-2,3,5,6-tetracarboxylic acid (H_4pztc) have never been reported up to now. In this paper, we report the synthesis and structure of a novel 3D lanthanide coordination polymers constructed with H_4pztc, $\{[Gd_2(pztc)(ox)(H_2O)_5]\cdot 6.5H_2O\}_n$. Single-crystal X-ray diffraction reveals that the structure of this complex belongs to Triclinic system, *P*-1 space group with a = 8.6049(17) Å, b = 10.028(2) Å, c = 13.450(3) Å, α = 94.72(3)°, β = 90.14(3)°, γ = 101.60(3)°. As shown in figure 1, Gd1 shows a nine-coordinated environment and Gd2 is eight-coordinated. Gd1 and Gd2 ions are bridged by $pztc^{4-}$ to form a greatly orderly 3D open network with cavities (figure 2).

注射成形稀土永磁材料的结构和性能

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摘　要：2:17型钐钴稀土永磁体是一种磁性能优异的永磁材料，具有很高的居里温度、较高的磁各向异性和饱和磁化强度。但是，这种稀土永磁材料的脆性很高，传统工艺很难制备形状复杂、精度高的小型器件。粉末注射成形技术（Powder Injection Molding，简称PIM）能很好的解决这方面的问题，它是从塑料工业引入粉末冶金中的一种新型的近净形成形技术，可以制备形状复杂和小型精密的零件。本文分别选用传统的热塑性粘结剂和新型的水基粘结剂进行了烧结稀土永磁体注射成形技术的研究。结果显示，由于热塑性粘结剂残余碳含量较高，磁体中出现大量ZrC相，胞状显微组织被破坏，磁体磁性能很低。而采用水基粘结剂（甲基纤维素溶液）为粘结剂，磁体残余碳含量很少，没有ZrC相出现，胞状显微组织完整，磁体磁性能较好：Br=0.97T, Hcj=871kA/m, BHmax=157kJ/m3。

关键词：2:17型钐钴永磁体；粉末注射成形；粘结剂；磁性能；稀土

Microstructure and magnetic properties of sintered rare earth permanent magnets by PIM

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Abstract: 2:17 type SmCo permanent magnets have excellent intrinsic magnetic properties such as very high Curie temperature, high anisotropy fields and relatively high saturation magnetizations. However, the magnets are difficult to form complex, small, precise parts by conventional manufacture process because of their high brittlement. These problems can be avoided when the magnets are prepared by powder injection molding (PIM). The PIM process is a newly-developed technology, which derives from the traditional shape-making capability of plastic injection molding and the materials flexibility of powder metallurgy. In this paper, the sintered magnets are prepared by PIM using thermoplastic binder and water based binder respectively. The results show that the sintered magnets by PIM using thermoplastic binder have high residual carbon content. Besides, there is a lot ZrC phases in the magnets, which destroy the cellular microstructure of the magnets. So the magnetic properties are very low. Water based binder is methylcellulose solution, which consists of deionized water and methylcellulose. There is little residual carbon and ZrC phases in the magnets by PIM using the binder. The magnets have homogeneous cellular microstructure and better magnetic properties: Br=0.97T, H_{cj}=871kA/m, BH_{max}=157kJ/m^3.

Key words: 2:17 type SmCo permanent magnets; powder injection molding; binder; magnetic properties; rare earth

微波法合成 LiEu1-xBix（MoO4）2 红色荧光粉

程士宝 陈晓霞

摘 要：采用微波法对LiEu1-xBix（MoO4）2体系进行了合成，并对体系的合成条件进行了优化。同时以NH4Cl为助熔剂研究了助溶剂用量对样品发光性能的影响，并分析了Bi离子作为敏化剂时的敏化机理以及Bi离子浓度对发光性能的影响。用XRD粉末衍射确认其为反应未完全，有较多反应物剩余。通过样品后处理纯化产物。荧光光谱仪分析其在394nm的紫外光激发下发出612nm的红光，且当x=0.10时发光强度达到最大。

关键词：微波法　红色荧光粉　LED　钼酸盐

Synthesize $LiEu_{1-x}Bi_x(MoO_4)_2$ by Microwave Method

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Abstract:A series of lithium europium double molybdate phosphors $LiEu_{1-x}Bi_x(MoO_4)_2$has been synthesized by Microwave Radiation Method.　The synthesis conditions were optimized and its photoluminescent properties were investigated, when x=0.10, the excitation spectrum and the emission spectrum are larger than other x value. we also Research the dosage of the flux about the luminescent properties. The Crystal Structure was measured by XRD and the XRD pattern shows that the refection is not perfect.

Key words: Microwave Method　Red phosphor　LED　molybdate

微波法合成（SrCa）MoO4：Eu,Bi

程士宝

摘 要：采用微波法对SrxCayMoO4：Eu1－x－y－z ,Biz体系进行了合成，并对体系的合成条件进行了优化。同时研究了Sr/Ca对样品发光性能的影响，并分析了Bi离子作为敏化剂时的敏化机理以及Bi离子浓度对发光性能的影响。用XRD粉末衍射确认其为白钨矿结构。荧光光谱仪分析样品在394nm的紫外光激发下发出612nm的红光，且当Sr/Ca＝1：1，z＝0.08时发光强度达到最大。

关键词：微波法　钼酸盐　LED　荧光粉

Synthesize LiEu1-xBix（MoO4）2 by Microwave Method

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Abstract：A series of lithium europium double molybdate phosphorsSrxCayMoO4：Eu1－x－y－z ,Bizhas been synthesized by Microwave Radiation Method. The influences of Sr/Ca about the luminous performance has been analysis .The synthesis conditions were optimized and its photoluminescent properties were investigated, when Sr/Ca＝1：1，z＝0.08, the excitation spectrum and the emission spectrum are larger than other x value. we also Research the dosage of the flux about the luminescent properties. The Crystal Structure was measured by XRD and the Morphology were measured by SEM.

Key words：Microwave Method　Red phosphor　LED　molybdate

非接触式激振器的研究与设计——对小叶片的激振

于元东

摘 要：根据电磁原理研制出一种新的非接触式激振设备。其测试精度高、噪音低、结构简单。为小叶片的测振实验提供了一种新的激振方法。

本文介绍了导电（磁性或非磁性）试件激振的工作原理和性能特点以及该激振器的结构设计和磁路分析。

关键词 ：电磁 激振 磁路

Non-contact exciter development——excitation of small blade

Yu yuandong

Abstract ：A non-contact exciter based on electromagnetic theory is developed. Test its high accuracy, low noise, simple structure. A new exciting technique is developed for vibration tests of small blade.

The principles, performance and characteristics of excited conductive plates (magnetic or non-magnetic materials) are illustrated in this paper.，as well as the structural design and analysis of the magnetic circuit.

Key word ：Electromagnetic exciting magnetic circuit

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{[(THF)2Na]3 [Ln(R-BINOLate)3]}稀土配合物的荧光性能研究1

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摘 要：本文采用紫外光对钐离子(Sm3+) 和钆离子（Gd3+）的2 种联萘酚稀土配合物的荧光光谱进行了实验研究。分析和讨论了它们的荧光谱线特性、配体和溶剂对荧光谱线的影响。

关键词：稀土配合物; 荧光光谱; 激光

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稀土 Tb 对磁性形状记忆合金 Ni50Mn29Ga21 性能的影响

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2.瑞科稀土冶金及功能材料国家工程研究中心，内蒙古，包头，014030)

摘 要：本文研究了磁性形状记忆合金Ni50Mn29Ga21Tbx(x=0,0.05,0.1,0.2,0.4,1.2)的显微组织、扫描能谱定量分析、差热分析和力学性能。结果表明加入稀土Tb后，合金晶体结构基本不变，马氏体相变点略有升高，材料的硬度和抗压强度得到显著提高。在合金中，Tb析出相主要以颗粒状分布在晶粒内和以网状分布在晶界。
关键词：磁性形状记忆合金；稀土；力学性能

Effect of Rare Earth Element Terbium on property of $Ni_{50}Mn_{29}Ga_{21}$ Magnetic Shape Memory Alloy

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Abstract: Effect of terbium on the microstructure, Scan energy spectrum, thermal analysis and Mechanical Property behaviors of $Ni_{50}Mn_{29}Ga_{21}$ magnetic shape memory alloy has been investigated in this paper. The results showed that the crystal structures of alloy did not changed, the martensite transformation temperature is increased a bit and the mechanical property of alloy have notable rise. With adding of rare earth Tb, it was mainly distribution within grain with graininess and grain boundary with netlike.
Key Words: Magnetic shape memory alloy; Rare earth; mechanical Property

CoSmxFe2-xO4 纳米晶铁氧体的制备及其电磁性能

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摘 要：用W/O微乳液法制备了CoSmxFe2-xO4（x=0.00～0.10, 步长0.02）纳米铁氧体粉晶。用X射线衍射仪(XRD)，透射电子显微镜(TEM)、振动样品磁强计（VSM）和阻抗/材料分析仪表征了样品的结构、形貌和电磁性能。结果表明，掺杂少量Sm3+并不改变样品的晶体结构，但其晶粒尺寸、饱和磁化强度、矫顽力和电磁损耗性能等都有不同程度的改变。

关键词：W/O微乳液；CoSmxFe2-xO4 铁氧体；电磁性能

Synthesis and Electromagnetic Properties of Nanocrystalline Ferrites $CoSm_xFe_{2-x}O_4$

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Abstract The nanocrystalline ferrites $CoSm_xFe_{2-x}O_4$ (x = 0.00 ~ 0.10, step 0.02）are prepared by W/O micro-emulsion method. The structures, morphologies and electromagnetic properties of the obtained products were characterized by the X-ray diffractometer (XRD), the transmission electron microscopy (TEM), the vibrating sample magnetometer (VSM) and the impendence/materials analyzer respectively. The results show that all samples doped with Sm^{3+} ions have spinel structures, but the values of the lattice parameter, the saturation magnetization, the coercivity and the ectromagnetic loss properties have some change as doping Sm^{3+} ions,

Keywords W/O micro-emulsion; $CoSm_xFe_{2-x}O_4$ ferrites; electromagnetic properties

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SrAl2B2O7:Eu 的发光性能和电子结构研究

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摘 要：本文采用固相法合成了SrAl2B2O7:Eu系列荧光粉，研究了它们在紫外和真空紫外激发下的发光性能。紫外激发下，SrAl2B2O7:Eu3+的最强发射峰位于610 nm附近，具有较高的发射强度和较好的色纯度，但是在真空紫外激发下，其发光强度却比较弱，通过分析SrAl2B2O7:Eu3+的激发光谱与其电子结构的计算结果，对该现象进行了解释。
关键词：SrAl2B2O7 真空紫外 密度泛函理论 电子结构

Abstract: The phosphor $SrAl_2B_2O_7$:Eu is synthesized successfully by solid-state reaction. Their photoluminescence properties are studied under ultraviolet(UV) and vacuum ultraviolet excitation(VUV). The strong red emission of 610 nm is observed under UV excitation, while the luminescence under VUV excitation is very weak. This phenomenon is evaluated by the combination of excitation spectrum and the electronic structure calculation results and possible explanation is proposed.

Key words: $SrAl_2B_2O_7$, VUV, density functional theory, electronic structure

CeO2 对激光熔覆碳化钛复合涂层微观结构及性能的影响*

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摘 要：探讨激光熔覆TiC4复合陶瓷涂层微观结构特征及稀土氧化铈对涂层微观结构及显微硬度的影响，在45钢基体上制作了TiC4复合陶瓷涂层及氧化铈改性的复合陶瓷涂层。用X射线衍射仪(X-ray diffractometer, XRD)、分析型扫描电镜(Analysis scanning electron microscope, ASEM) 、显微硬度计对涂层组成、组织形态、元素结构特征及显微硬度进行了分析。结果表明：利用激光熔覆方法制作的TiC4陶瓷层具有典型的包覆相和硬质点相结构，加入适量稀土氧化铈对涂层组织包覆相有改善作用，稀土的加入使得涂层组织致密度得到提高，TiC4晶粒细化了，晶粒尺寸小于1μm，晶粒形状由长条形变为细球形，当稀土氧化铈的添加质量分数为0.30~1.0%时，涂层致密度最好，平均显微硬度HV达到700MPa；添加过多的稀土对改善陶瓷涂层性能反而不利，涂层的组织中包覆相比例增加，部分TiC4晶粒长大了，晶粒尺寸大于1μm，且呈柳叶状，显微硬度显著下降。

关键词：激光熔覆　陶瓷涂层　表面改性　稀土

Abstract：The microstructure and characteristics of laser clad coating with TiC_4 ceramic layer is studied. TiC_4 ceramic layer is deposited on 45 carbon steel substrate by laser cladding technique. TiC_4 ceramic coatings with different contents of CeO_2 are cladded on a 45 carbon steel substrate. The clad coatings are examined and tested for microstructural features, chemical compositions, phase structure, microhardness by scanning electron microscope (SEM), X-ray diffraction (XRD) analysis, micro-hardness tester separately. TiC_4 particles phase and a cladding structure with TiC_4 surrounded by solid solution(Ni, Mo, and part of TiC_4) was found by X-ray diffraction, experimental results show the adding of rare earth CeO_2 helps to enhance the density of coating, TiC_4 crystal grain size become smaller, the pattern of particles submit spheric or similar to spheric, the average particles size less than 1μm, and the coating's micro-hardness can be increased, when the content of CeO_2 reaches 0.3-1.0% (mass fraction), the clad coating shows the best density, and its micro-hardness reaches 700Mpa (HV), increased by 10%, when the clad coating's surface doped with excessive CeO_2, it is found that the TiC_4 crystal grain size become larger, the pattern of particles submit long strip, and the cladding layer's micro-hardness decrease quickly, the surface average micro-hardness decrease to 450Mpa (HV).

Key words：Laser cladding　Ceramic coating　Surface modification　Rare earths

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Al-Li-Sc-Zr 合金界面电子结构与强化作用研究

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摘 要：随着航天航空事业的发展，Al-Li合金作为一种轻质铝合金结构材料，其良好的性能备受关注。添加微量Sc、Zr元素对Al-Li基合金相和相界面结构及其力学性产生重要影响。本文将 “固体与分子经验电子理论”(EET理论)与“改进的TFD理论”结合，应用硬球模型方法，研究添加微量Sc、Zr元素的Al-Li基合金相空间及相界面的价电子结构与其力学性能的关系。

1、建立了Al-Li-Sc-Zr合金固溶体系中偏聚单元的价电子结构计算模型，并计算了晶胞的价电子结构与相结构因子，探讨了相结构因子与力学性能的关系。研究发现：在添加有微量Sc、Zr元素的Al-Li系合金的固溶体中，Sc、Zr原子和Al原子之间存在强烈的相互作用，合金元素与Al形成的键络强度明显提高。且在固溶体中容易形成一些细小偏聚区，起到了固溶强化的作用。

2、计算了时效过程中主要强化相，如δ′(Al3Li)相，β′(Al3Zr)、(Al3Sc)相及Al3(ScxZr1-x)复合相粒子晶胞的价电子结构和相结构因子，分析了相价电子成键状态与合金强化的内在联系，揭示出主要析出相β′(Al3Zr)、(Al3Sc)及Al3(ScxZr1-x)复合相粒子，能够钉扎位错和亚晶界，阻碍晶界的移动，从而抑制晶粒的长大与合并，成为δ′(Al3Li)的非均质形核。大量的δ′相弥散析出起到提升基体整体键络强度，对合金产生强化作用，提高了合金的强度和热稳定性。

3、计算合金中基体与析出相界面电子结构和界面结合因子，并分析了合金相界面结合因子对界面性能的影响。研究结果表明：合金的异相界面电子密度差较小，异相界面能较小，理论计算结果与实测结果符合得较好。

关键词：Al-Li基合金；EET理论；价电子结构；界面能

Al-Mg-(Si)-(Sc)-(Zr)合金时效初期微结构演化的模拟研究

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摘 要：运用蒙特卡罗方法计算模拟了加入微合金元素Si, Sc和Zr 的Al-Mg合金时效初期微结构的演化过程，分析了微结构演化过程中溶质原子偏聚的特征及其与空位的相互作用；对Si, Sc和Zi与空位复合体的尺寸及空位周围原子的概率分布进行讨论，揭示了空位作用的机理。

关键词：Monte-Carlo方法；微结构演化；铝镁合金

稀土元素对 AgNi 体系改性机理研究

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摘 要：研究了添加微量稀土(稀土的质量分数<0.2%)银合金触点材料的显微组织、硬度、弯曲次数等，用扫描电子显微镜观察了材料的显微组织和第二相分布，发现添加质量分数为0.2%微量稀土能够细化晶粒，并以固溶或球状第二相形式存在，可以强化合金，有效地延缓了材料的回复与再结晶，使材料的抗拉强度上升，断后延伸率提高，材料延性改善，显微硬度趋于均匀，弯曲次数提高。

关键词：稀土；银基合金；改性
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Study on Modified Mechanics of AgNi Alloy by Rare-earth

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Abstract：Some tests on silver ornamental material are carried out by adding rare earth, to research the dependence of hardness on the temperature and degree of deformation. By scanning &analyzing with the electronic microscope, it is found that the rare earth in small amount has remarkably fined the grains of silver alloy. The rare earth is distributed in the alloy in the form of solid solution or spherical second phase depending on its solubility in silver, which can strengthen the alloy and delay its recovery and improve the silver ornamental material's resistance to natural aging softening. The tensile strength raised the rate of extension increase when fractured, micro hardness more uniform, extensibility and bending times improved.

Keywords：Rare-earth，Silver-based alloy，Modify

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Tb0.4Fe0.6/Fe0.5Co0.5 多层薄膜超磁致伸缩性能研究

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摘 要：为了提高低磁场下的磁致伸缩率λ, 需要降低饱和磁场强度Hs。而Hs=2K1/Ms（K1为磁晶各向异性常数, Ms为饱和磁化强度），故除降低K1以外, 加大Ms 也是一条途径。但单一薄膜难以解决Ms和λ的矛盾, 我们采用稀土和软磁材料复合的多层膜解决了这一矛盾。用磁控溅射方法制备了Glass(0.3mm)/[Tb0.4Fe0.6(2000nm)/ Fe0.5Co0.5(1000nm)]5多层膜，软磁相Fe0.5Co0.5膜具有高饱和磁化强度（Ms），从图1中看出，该样品在0.02T 磁场强度下获得5.5×10-4的磁致伸缩系数。而单层Tb0.4Fe0.6薄膜要在约0.3T下才能达到这一数值。

关键词：超磁致伸缩；多层膜；材料

Giant Magnetostriction of $Tb_{0.4}Fe_{0.6}/Fe_{0.5}Co_{0.5}$ Multilayers Thin Film

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Abstract: For improving the magnetostriction of thin films material in low applied magnetic fields, reducing the saturation magnetic field intensity Hs is necessary. Because $Hs=2K_1/Ms$(K_1 is anisotropy constant of magnetic crystal and Ms is the saturation magnetization intensity), improving Ms value of material is one way to improving the magnetostriction. In t his paper , Glass(0.3mm)/[$Tb_{0.4}Fe_{0.6}$(2000nm)/ $Fe_{0.5}Co_{0.5}$(1000nm)]$_5$ multilayer thin films were fabricated by R.F. magnetron sputtering. The results indicate that the in-plane magnetostriction of $Tb_{0.4}Fe_{0.6}/Fe_{0.5}Co_{0.5}$ multilayer thin film increases and reaches 5.5×10^{-4} under the external magnetic field 0.02T.

Key words:giant magnetostriction ; multilayer thin film; material

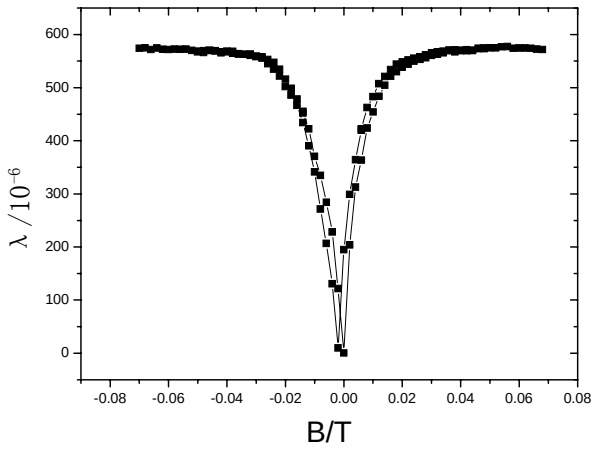


图1 TbFe/ FeCo多层膜在低场下磁致伸缩性能

Fig. 1 Magnetostriction of TbFe/ FeCo multilayer thin film in low field

混合稀土对 38CrMoAlA 钢气体渗氮的影响

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摘 要：本文研究了La、Ce、Pr、Nd混合稀土对38CrMoAlA钢的气体渗氮行为的影响，并对钢渗氮处理过程中的稀土催渗机理进行了探讨。研究发现，稀土能明显提高38CrMoAlA钢表面及近表面硬度，而且稀土的作用在高温渗氮条件下比在低温渗氮条件下更明显，分析认为这是由于在稀土周围形成了氮原子气团造成的；但稀土的加入略减小了渗层厚度，原因是以稀土原子为中心的间隙原子气团的“土坝效应”。
关键词：稀土，渗氮，催渗，机理

Effects of Rare Earth on Gas Nitriding in 38CrMoAlA Steel

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Abstract: The effect of rare earth on the gas nitriding behaviors of 38CrMoAlA steel was studied in this paper. The results show that the rare earth could raise the microhardness of surface and the subsurface of the 38CrMoAlA steel, but decrease the penetration thickness slightly. These effects were attributed to the nitride atomic clusters around the rare earth atoms. The results also show that the effects of rare earth on the gas nitriding in 38CrMoAlA steel are more obvious when nitrided at high temperature than at low temperature.
Key words: rare earth, nitriding, catalytic effect, mechanism

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Sm3+掺杂对锰锌铁氧体微波电磁性能的影响

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摘 要：采用固相法合成了稀土钐掺杂的锰锌铁氧体Mn0.5Zn0.5Fe2-xSmxO4（x=0, 0.01, 0.03, 0.05），通过XRD对合成粉末进行了晶体结构的分析，结果表明：在1200℃下保温5h制得的粉体为单一的尖晶石型铁氧体，少量稀土钐掺杂，使得晶格常数增大，说明钐离子取代离子半径小的铁离子，使得晶格扩大，但掺杂量进一步增大后晶格常数反而降低。使用Agilent8722ET网络分析仪在2～18GHz的频率范围内对其微波电磁特性进行测试，结果显示由于少量稀土钐的掺杂，ε'稍有增加，ε"总体数值变化不大，但是最大值出现的位置移向高频；μ"和tanδm有很好的频率特性，而且少量稀土钐的掺杂使得其数值均大大增加，利用微波电磁理论分析了磁导率和介电常数的变化机理。

关键词：锰锌铁氧体；稀土；微波电磁特性；钐掺杂

Influence of Sm^{3+} Substitution on the Microwave Magnetic Performance of Mn-Zn Ferrite

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Abstract: Mn-Zn ferrite doped with Sm^{3+}, $Mn_{0.5}Zn_{0.5}Fe_{2-x}Sm_xO_4$（$x$=0, 0.01, 0.03, 0.05）, were prepared by the conventional ceramic technology. The structure and electromagnetic properties of the calcined samples were studied using powder X-ray diffraction (XRD) and network analyzer (Agilent 8722ET). All the XRD patterns showed the single phase of the spinel ferrite without other intermediate phase. The lattice parameters of ferrites doped with Sm^{3+} increased, indicating that the substitution of Sm^{3+} occurs on Fe^{3+} basis site and results in a expand of the crystal cell. With the amount of doping increase, but lower the lattice constant. The microwave electromagnetic properties of the samples have been studied at the frequency range from 2GHz to 18GHz. It was shown that ε' increased slightly, and the maximum of ε'' appeared at higher frequency position with Sm^{3+} doping.μ'' and tanμ_r were improved significantly. All the reasons have also been discussed using electromagnetic theory.

Key words: Mn-Zn ferrite; Rare earth; Microwave electromagnetic properties; Sm^{3+} substitution

掺杂 Bi2O3 对 Y2O3-2TiO2 系微波介质陶瓷材料性能的影响

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摘 要：本文以Y2O3-2TiO2系微波介质陶瓷为研究对象，利用XRD,SEM测试来研究掺杂Bi2O3对Y2O3-2TiO2系微波介质陶瓷烧结性能和介电性能的影响。掺杂前后材料主晶相皆为烧绿石结构。实验结果表明:适量的Bi2O3掺杂能够降低烧结温度，提高材料的致密性并改善其介电性能。Bi2O3掺杂量为15wt%时，烧结温度从1460℃降低到1320℃.其εr≈63.09，tanδ≈1.75×10-3(1MHz), Q•f=3589.8(4.63GHz), τf =12.5ppm/℃。
关键词：Y2O3-2TiO2系微波介质陶瓷；介电常数；品质因数

Influence of Bi_2O_3 additives on properties of Y_2O_3-2TiO_2 microwave dielectric ceramic

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Abstract: Y_2O_3-2TiO_2_based ceramic doped with Bi_2O_3 by solid phase was prepared, and the relation between the doping ratio and dielectric character was investigated. The major crystal phases of pure and Bi_2O_3-doped Y_2O_3-2TiO_2 ceramic were all pyrochlor by XRD analysis. It was showed that proper Bi_2O_3 additives could lower the sintering temperature and improve the dielectric property of material. The 15wt%Bi_2O_3-doped Y_2O_3-2TiO_2_based ceramic sintered at 1320℃, and the dielectric properties: ε_r≈63.09, $tan\delta$≈1.75×10^{-3}(1MHz), Q•f=3589.8(4.63GHz), τ_f =12.5ppm/℃.

Keywords: Y_2O_3-2TiO_2 ceramic; Dielectric constant; Q•f value

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镝掺杂 W 型铁氧体的制备及性能研究

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摘 要：本文采用固相球磨法制备了W型铁氧体Ba1-xDyx(Zn0.3Co0.7)2Fe16O27粉体。利用X-射线衍射分析，差热-热重分析及扫描电子显微镜对Ba1-xDyx(Zn0.3Co0.7)2Fe16O27粉体样品晶化过程进行研究。利用微波网络分析仪对W型铁氧体粉体的微波特性进行研究，考察稀土元素Dy掺杂对W型铁氧体微波特性的影响。结果表明：1300℃时，生成了单一的W型铁氧体相，形成了平面六角片状结构。稀土元素的掺入能有效的调整W型铁氧体的微波电磁参数，使自然共振频率向高频移动，减小复介电常数，有利于阻抗匹配。在一定范围内增大Dy的掺杂量，有利于进一步获得低介电损耗和高磁导率的铁氧体材料。

关键词：W型铁氧体，镝掺杂，微波电磁参数

Study on Preparation and Properties of Dy doped W-type Ferrite

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Abstract：W-type ferrite $Ba_{1-x}Dy_x(Zn_{0.3}Co_{0.7})_2Fe_{16}O_{27}$ powders were prepared by Solid State Method. X-ray diffraction(XRD), thermal analysis and scan electron microscope(SEM) were used to study the information on the crystallization process of the W-ferrite. Microwave network analyzer was used to study the magnetic properties of W-type ferrite and the influence of doping amount on the magnetic properties. It was found that powders had been crystaled into the single phase W-ferrite and formed W-type hexagonal plane ferrte at 1300℃. Rare earth element Dy substitution can adjust hyperfine parameters magically, increase the natural resonance frequency, decrease the complex permittivity. Increasing Dy-doped in a certain was conducive to obtain lower dielectric loss and higher magnetic loss ferrite materials.

Keywords：W-type ferrite ， Dy Doped ， Microwave electromagnetic parameter

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铒硼硅酸盐稀土玻璃的析晶行为

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摘 要：高含量稀土玻璃在激光防护材料方面具有重要的应用，通过对稀土玻璃析晶行为的研究，有助于制备出透明的高稀土含量稀土玻璃。分别制备了透明的铒硼硅酸盐稀土玻璃和富B2O3、富SiO2、富Al2O3的铒硼硅酸盐稀土玻璃，并在1100℃下对各种玻璃样品进行热处理。采用XRD、SEM等分析测试方法对Er2O3-B2O3-SiO2-Al2O3系玻璃的析晶行为进行研究，并探讨了玻璃组成对析晶产物的影响。结果表明，铒硼硅酸盐稀土玻璃的局部结构与ErBO3晶相的结构具有一定的相似性；富B2O3、富SiO2、富Al2O3的铒硼硅酸盐稀土玻璃会发生失透现象，稀土玻璃发生失透是由玻璃析晶引起的，其中铒硼硅酸盐稀土玻璃中最易析出的晶相是ErBO3。

关键词：硼硅酸盐玻璃；氧化铒；析晶行为；稀土玻璃

Research on the devitrification abilities of the Erbium Borosilicate Glasses

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Abstract: High rare-earth glasses have important applications in laser protective materials. The study on the crystallization of rare earth glasses is helpful to prepare transparent high rare-earth glasses. Transparent erbium borosilicate glasses and boron rich, silicate rich, aluminate rich glasses were prepared separately. The heat treatment on 1100℃ was taken. The XRD, SEM analysis was used for the study on the crystallization of Er_2O_3-B_2O_3-SiO_2-Al_2O_3 glasses. Then the effect of the glass composition on the devitrification products was investigated. The results show that local structure of erbium borosilicate glasses has some similarity with the structure of $ErBO_3$ crystal. The transmission loss was happened of boron rich, silicate rich, aluminate rich glasses. The transmission loss of rare-earth glasses was caused by the crystallization. $ErBO_3$ crystal was most easily precipitating of erbium borosilicate glasses.

Key words: borosilicate glasses, Er_2O_3, devitrification abilities, rare-earth glasses

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热处理时间对 La0.55Nd0.15Pr0.05Mg0.25Ni3.3Al0.1 储氢合金结构和储氢性能的影响

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摘 要：本文研究了铸态和热处理La0.55Nd0.15Pr0.05Mg0.25Ni3.3Al0.1储氢合金在1123K处理4h、8h、12h和16h的组织结构和储氢性能。XRD和SEM分析表明，合金中的主相是(La, Mg)2(Ni, Al)7 相、 La(Ni, Al)5相和 (La, Mg)2(Ni, Al)4相。在热处理温度为1123K时，当热处理时间超过8h以上，合金中存在(La, Mg)(Ni, Al)3相。从压力-组成等温线可以看出，延长热处理时间，压力平台从两个变为一个，这说明La(Ni, Al)5 相的比例随着热处理时间的延长显著减少。

The effects of annealing time on the structure and hydrogen storage properties of La0.55Nd0.15Pr0.05Mg0.25Ni3.3Al0.1 hydrogen storage alloy

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Abstract:As-cast and annealed La0.55Nd0.15Pr0.05Mg0.25Ni3.3Al0.1 hydrogen storage alloys were prepared, and the effects of annealing at 1123 K for 4 h、8 h、12 h、16 h on the structure and hydrogen storage of the alloys are reported in this paper. XRD and SEM analyses revealed that the major phases of the alloys are the (La, Mg)2(Ni, Al)7 phase, the La(Ni, Al)5 phase and the (La, Mg)2(Ni, Al)4 phase. The (La, Mg)(Ni, Al)3 phase exists in the alloys after annealing for 8 h at 1123 K. Pressure–composition isotherms indicate that, with a prolongation of the annealing time, the pressure plateau changes from two to one, which indicates that the proportion of the La(Ni, Al)5 phase dramatically decreases with a prolongation of the annealing time.

Keywords: RE-Mg-Ni hydrogen storage alloy; Annealing time; Alloy structure; P-C isotherms

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Ce1-xSmxO2-δ 溶胶-凝胶法的合成及其导电性能

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摘　要：利用溶胶-凝胶法合成了Ce1-xSmxO2-δ (x = 0, 0.1, 0.2)系列固体电解质, 采用XRD、Raman和交流阻抗技术研究了电解质的结构与导电性能的关系。XRD结果表明，所有样品均呈现CeO2结构，形成了Ce1-xSmxO2-δ固溶体。溶胶-凝胶法合成的Ce1-xSmxO2-δ粒度均匀、颗粒小，故在较低温度 (1500 oC) 时便可形成高致密样品，低于传统的高温固相法烧结温度 (1600 - 1650 oC)。较多Sm3+的掺入能形成较多的氧空穴，更有利于O2-的传递，从而使得Ce0.8Sm0.2O2-δ的电导性能高于Ce0.9Sm0.1O2-δ样品。

关键词：固体电解质；溶胶-凝胶法；氧空穴；电导率

Synthesis and Electrical Properties of $Ce_{1-x}Sm_xO_{2-\delta}$

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Abstract: A series of $Ce_{1-x}Sm_xO_{2-\delta}$ (x= 0, 0.1 and 0.2) solid electrolytes were prepared by a citrate sol-gel method. Effects of microstructures on their electrical properties were investigated by X-ray diffraction (XRD), Raman spectroscopy and AC impedance spectroscopy. The XRD results confirmed the formation of $Ce_{1-x}Sm_xO_{2-\delta}$ solid solution with uniform particle sizes, which could be sintered 1500 ^oC. The Raman spectroscopic results show that a higher substitution of Sm^{3+} into the ceria lattice could enhance the formation of oxygen vacancies, which was beneficial to the migration of O^{2-}, which resulted in a higher electrical conductivity obtained on the $Ce_{0.8}Sm_{0.2}O_{2-\delta}$ compared to that of the $Ce_{0.9}Sm_{0.1}O_{2-\delta}$.

Keywords: Solid electrolyte; Sol-gel method; Oxygen vacancies; Electrical conductivity

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基于离子液体的稀土绿色分离化学

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摘 要：室温离子液体是指在室温或接近室温范围内为液体，且全部由阴、阳两种离子组成的有机类离子化合物。因其在催化、合成、分离、电化学等方面具有广泛的应用价值，故日益受到关注。室温离子液体作为一种新兴绿色溶剂，具有一系列不同于传统挥发性有机分子溶剂的独特性质，例如：液态温度范围宽，溶解能力强，无可测蒸气压，稳定性高，粘度大，导电性良好。正是不挥发、不易燃等优点，使之有可能在溶剂萃取过程中取代有机溶剂发挥重要作用。目前，在离子液基萃取金属离子的研究中，其绿色高效的特点已引起了人们的广泛关注。本文主要介绍我们实验室近年来利用离子液体在稀土分离化学中的研究工作，主要围绕下面几个方面的内容：

在液/液萃取分离中的应用。研究了稀土分离常用萃取剂有机膦，羧酸以及胺（氨）类萃取剂在离子液体中萃取稀土的机理，并研究了相关的热力学和动力学特点。以Cyanex923(5)和[Cnmim]PF6用于RE(III)萃取分离的机理研究及其热、动力学；以氰特公司的Cyphos@IL104为代表的双功能离子液体萃取剂（Bifunctional Ionic Liquid Extractant, BILE）和生物柴油组成的新绿色分离体系在稀土过程中的应用；纯的[Cnmim]PF6直接萃取分离Ce（IV）与Th（IV）和RE（III），以及F（I）存在下[Cnmim]PF6与DEHEHP混合选择性分离Ce（IV）；利用N1923伯胺萃取剂溶解在离子液体中进行反胶团增溶萃取Th（IV）等新萃取分离体系的研究。

在液固分离中的应用。研究将离子液体和萃取剂等固定在Amberlite XAD-7聚甲基丙烯酸浸渍树脂，溶胶－凝胶材料上进行稀土及相关金属的分离和回收。通过离子液体共溶解纤维素和壳聚糖制备生物吸附材料用于相关的重金属分离回收。

利用离子液体新萃取体系，探讨在“一锅煮”法制备稀土氟化物及其相关性质，以及电化学法制备金属氧化物和功能化石墨材料等相关的工作。

这些研究不仅为稀土绿色分离化学的新工艺开发提供了重要的研究基础，同时对于开拓离子液体研究的新领域也具有重要的意义。

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掺杂 Y2O3, Sm2O3 对氧化铝瓷介电性能的影响

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摘 要：研究了Y2O3、Sm2O3对氧化铝瓷烧结性能、介电性能和显微组织的影响。结果表明，添加稀土氧化物可以显著降低氧化铝瓷的烧成温度，提高试样的致密性，降低试样的结构损耗。掺稀土氧化物的氧化铝瓷在1600℃保温2h烧结下，相对密度达98.8%以上,介质损耗达到4.2×10-3。微观结构分析表明，Y2O3、Sm2O3抑止氧化铝晶粒生长，净化晶粒，完善显微结构，形成致密化结构。

关键词：氧化铝；稀土氧化物；介电性能；显微结构;

Effect of Y_2O_3, Sm_2O_3 on Dielectric behavior of Alumina Ceramics

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Abstract：The effects of Y_2O_3 and Sm_2O_3 on the sintering, dielectric behaviors and microstructure of Al_2O_3 ceramics were investigated. The experimental results show that the sintering temperature can be decreased, density and dielectric behavior of sample can be improved by adding rare earth in alumina ceramics. The relative density of rare-earth-doped alumina ceramics reaches to 98.8% at 1600℃ for 2h, its loss reach to 4.2×10^{-3}, respectively. The analysis of microstructure indicates that the introduction of Y_2O_3 and Sm_2O_3 in Al_2O_3 can restrain the growth of grains, purity the grains, perfect the microstructure and form a full-density structure.

Key words: alumina; rare earth oxide; dielectric property; microstructure

近紫外 LED 用蓝绿色荧光粉 Sr4Si3O8Cl4: Eu2+的研究

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摘　要：采用高温固相法合成了Sr4Si3O8Cl4: Eu2+荧光粉。XRD表明荧光粉的组成基本为单相，而且掺入Eu2+对荧光粉物相的影响很小。在370 nm紫外光激发下， Sr4Si3O8Cl4: Eu2+发射宽带蓝绿色光，其中心位于485 nm, 源自Eu2+离子的4f65d1 → 4f7 跃迁。监测485 nm的发射峰，所得材料的激发光谱是一个主峰位于324 nm的宽峰。研究了Eu2+掺杂浓度对Sr4Si3O8Cl4: Eu2+荧光粉发射光强度的影响。研究结果显示，随着Eu2+浓度的增大，发射光强度逐渐增大，直至临界浓度x = 0.08后减小。样品的激发与发射光谱如图1所示。用Mg2+部分取代Sr4Si3O8Cl4: Eu2+荧光粉的Sr2+，可以大大提高发射强度。将荧光粉封装在InGaN紫外芯片（λem = 370 nm）上制作了LED器件（图2），测定了器件的电致发光光谱及色坐标等参数。Sr4Si3O8Cl4: Eu2+荧光粉能有效被InGaN芯片发射的紫外光激发并发出强的蓝绿色荧光，是一种可应用在近紫外芯片白光LED的蓝绿色荧光粉。

关键词：Sr4Si3O8Cl4: Eu2+；LED；荧光粉；稀土

Study on $Sr_4Si_3O_8Cl_4$: Eu^{2+} Bluish-green-emitting Phosphor For NUV-based LED

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Abstract: $Sr_4Si_3O_8Cl_4$: Eu^{2+} phosphor was prepared by conventional solid state reaction (SS). Excited by 370 nm near-ultraviolet light, the phosphor shows an efficient bluish-green wide-band emission centering at 485 nm, which originates from the $4f^6 5d^1 \rightarrow 4f^7$ transition of Eu^{2+} ion. The excitation spectrum of the phosphor is a broad band extending from 250 nm to 400 nm. The excitation and emission spectra is shown in Figure 1. The effect of doped Eu^{2+} concentration on the emission of $Sr_4Si_3O_8Cl_4$: Eu^{2+} was also investigated. Partial substitution of Sr^{2+} with Mg^{2+} greatly enhances the bluish-green emission of the phosphor. LEDs were fabricated by coating the phosphor onto 370 nm-emitting chips. The electroluminescence spectrum and the performance parameters of the fabricated LED were measured. A photograph of the lighting bluish-green LED under 20 mA forward bias is shown in Figure 2. The results indicate that $Sr_4Si_3O_8Cl_4$: Eu^{2+} is a potential bluish-green phosphor for NUV-based white LEDs.

Keywords：$Sr_4Si_3O_8Cl_4$: Eu^{2+}；LED；phosphor

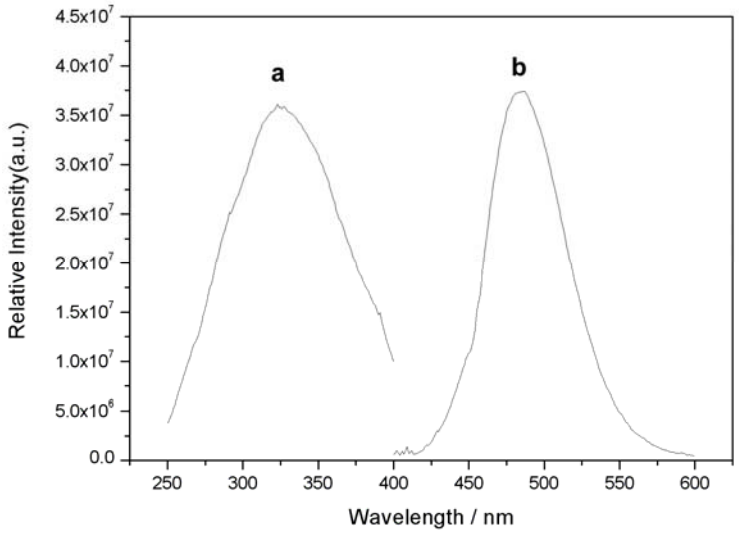


图 1. $Sr_4Si_3O_8Cl_4$: Eu^{2+}荧光粉的激发(a)与发射(b)光谱

Fig.1. Excitation (a, λ_{em} = 484 nm) and emission (b, λ_{ex} = 370 nm) spectra of $Sr_4Si_3O_8Cl_4$: Eu^{2+}

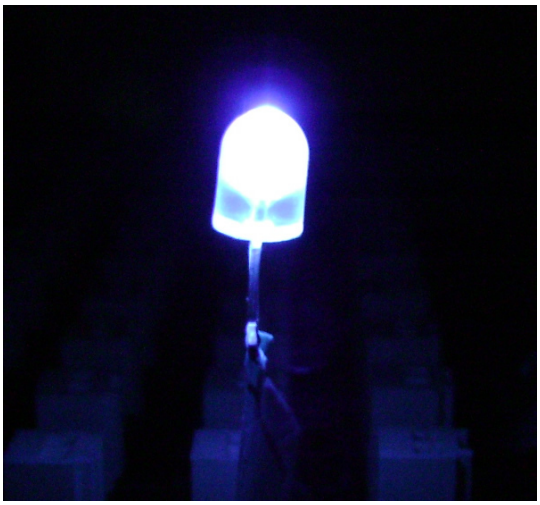


图 2. 20 mA 正向电流驱动下的蓝绿色 LED 器件

Fig.2. Photograph of the lighting LED under 20 mA forward bias

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乙酰胺-尿素-NaBr 熔体中电沉积 Ce-Mg-Ni 合金的研究*

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摘 要：在353 K的乙酰胺-尿素-NaBr熔体中,Ni(Ⅱ)一步不可逆还原为金属Ni,测得在Pt电极上α为0.21和D0为1.15×10-8cm2·s-1。Ce(Ⅲ)和Mg(Ⅱ)不能单独还原为Ce和Mg,但是可以被Ni(Ⅱ)诱导共沉积.由恒电位电解法得到非晶态的Ce-Mg-Ni合金膜.合金中Ce的含量随着阴极电势的负移增大,随Ce(Ⅲ)/Ni(Ⅱ)摩尔比增大而先增大后减小,Ce的最大含量可达49.70%;Mg的含量随着阴极电势的负移而增大,最大可达4.55%。

关键词：乙酰胺-尿素-NaBr熔体;电还原;诱导共沉积; Ce-Mg-Ni合金膜;非晶态合金

Study on Electrodeposition of Ce-Mg-Ni alloy film in acetamide-urea-NaBr melt

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Abstract: The Ni（Ⅱ） was reduced to Ni atom irreversibly by a one-step reaction in acetamide-urea-NaBr melt at 353K. The ． was determined 0.21 on Pt electrode.the D_0 was determined $1.15\times10^{-8}cm^2.s^{-1}$ on Pt electrode. Although the Ce（Ⅲ）and the Mg（Ⅱ） can't be reduced to Ce and Mg alone, they can be inductively codeposited with Ni（Ⅱ） to obtain an amorphous Tb-Mg-Ni alloy film by potentiostatic electrolysis. The content of Ce in the alloy increase with the increasing of the molar ratio of Ce（Ⅲ）/Ni（Ⅱ） and the maximum was 49.70wt%. The content of Mg in the alloy increase with the increasing of the cathodal potential and the maximum was 4.558wt%.

Key words acetamide-urea-NaBr melt；electroreduction； inductive codeposition; Ce-Mg-Ni alloy film ； amorphous alloy

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多进出口模糊萃取分组分离新工艺

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摘 要：多进出口模糊萃取分组分离工艺是近年来开发出的一种新工艺，新技术。该工艺特别适用处理多矿种稀土矿如：轻稀土矿、富铕稀土矿和中、高钇稀土矿中任意两、三种矿的分离厂使用。新工艺具有原料适用范围广，处理量大，设备级数少，酸碱消耗低，贵金属元素回收率高，富集度高等的优点。是目前唯一能做到一个分组分离工艺，同时分组分离多矿种的新工艺；新工艺已有一条年处理1200吨富铕稀土矿和600吨高钇稀土矿的分组分离生产线，运转三年了，产品质量稳定，酸碱消耗低，达到了理想的设计效果。

关键词：多进出口；模糊萃取；新工艺；稀土

Multi-inlet-outlet Fuzzy Extraction for rare earth separation process

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Abstract: MIMO(Multi-inlet-outlet) Fuzzy Extraction is a new technology that developed in recent years for separation process. In particular, the MIMO Fuzzy Extraction is suitable for mixed-mine rare earth such as light rare earth , rare-earth of rich europium and has been used in the separation plant for arbitrary two or three mine. Moreover, the MIMO Fuzzy Extraction has such advantage as wider range of raw materials, more processing capacity, less equipment levels, lower consumption of acid and alkali, higher recovery ratio of precious metals and more enrichment degree. Currently, the MIMO Fuzzy Extraction is not only a grouping and separating technics but also a method for separating multi-mines. The MIMO Fuzzy Extraction has been applied to a product line, which can handle with 1,200 tons of Eu-rich rare earth and 600 tons of rare earth with high yttrium each year. The product line has been in operation for three years and it shows the ideal results of stability product quality and low consumption of acid-alkali.

Key words： Multi-inlet-outlet；fuzzy extraction； new technology； rare earth

高比表面纳米 CeO2 的制备

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摘 要：采用模板法，通过改变表面活性剂和前驱体类型，制备了一系列纳米 CeO2，并对样品进行 X-射线粉末衍射(XRD)、N2 吸附、热重-差热（TG-DTA）和空气气氛程序升温氧化（air-TPD）表征。结果表明，以烷基硫酸钠为模板、CeCl3 为前驱体可以制备出晶粒尺寸 2 nm、比表面积 300m2/g 以上的纳米 CeO2。表面活性剂和前驱体类型对制备的 CeO2 的性质有一定影响。其中以表面活性高的表面活性剂为模板制备的 CeO2 具有相对较小的晶粒尺寸和较大的比表面积，而前驱体除对晶粒尺寸和比表面积有影响以外，还影响样品的结构，以 Ce(Ac)3 为前驱体制备的 CeO2 具有一定介孔结构。

The Synthesis of High-surface Area Nano-CeO2

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Abstract: A series nano-CeO2 used different surfactants and salts as template and precursor were synthesized by surfactant-templated method and investigated through X-ray diffraction(XRD), N2-sorption, thermogravimetric and differential thermal analysis(TG-DTA) and Air-temperature programmed oxidation(Air-TPO).The results show that the kinds of surfactant and salt have some effect on the property of CeO2 and that synthesized used sodium alkyl sulfate as template and CeCl3 as precursor has surface area above 300 m2 g-1 and crystallite size around 2 nm after calcination at 400 oC.The CeO2 synthesized used surfactant with high surfactivity has high surface area and small crystallite size. The precursor would effect the structure of CeO2, besides the surface area and the crystallite size. For example, the CeO2 has mesoporous structure synthesized used Ce(Ac)3 as precursor.

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La0.65-xPrxNd0.12Mg0.23Ni3.4Al0.1(x = 0.0-0.2)储氢合金电化学性能研究

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摘 要：为了了解Pr取代La对La-Mg-Ni系（AB3.5型）储氢合金性能的影响，研究了La0.65-xPrxNd0.12Mg0.23Ni3.4Al0.1 (x = 0.0、0.1、0.2) 储氢合金的电化学性能，重点考察了电化学动力学特性。试验表明，Pr取代La使合金的储氢容量有所降低，但循环稳定性没有明显的变化。Pr取代La对合金的电化学动力学性能产生了明显的影响，合金电极在放电电流密度Id=1800mA·g−1的高倍率放电能力（HRD）从26.0%（x = 0.0）显著地增加到60.0%（x = 0.1），然后缓慢减小到55.8%（x = 0.2）。电化学阻抗谱、线性极化曲线、阳极极化曲线及氢扩散系数测量结果均表明，合金中添加Pr改善了合金电极的电化学动力学特性。

关键词：稀土系储氢合金；AB3.5型储氢合金；金属氢化物电极；电化学性能；电化学动力学

An electrochemical study of $La_{0.65-x}Pr_xNd_{0.12}Mg_{0.23}Ni_{3.4}Al_{0.1}$ (x = 0.0-0.2) hydrogen storage alloys

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Abstract: In order to know the effect of substituting Pr with La on the electrochemical properties of the La–Mg–Ni system ($AB_{3.5}$-type) hydrogen storage alloy, the electrochemical kinetics properties of the $La_{0.65-x}Pr_xNd_{0.12}Mg_{0.23}Ni_{3.4}Al_{0.1}$ (x = 0.0, 0.1, 0.2) hydrogen storage alloys have been expressly studied. The electrochemical testing shows that substituting Pr with La mildly decreases the hydrogen storage capacity of alloys, but the cycling life of alloys insignificantly changes. However, the high-rate dischargeability (HRD) of the alloy electrodes remarkably increases from 26.0% (x = 0.0) to 60.0% (x = 0.1) and then slowly decreases to 55.8% (x = 0.2) at the high discharge current density I_d=1800mA·g^{-1}. Meanwhile, the testing results of the electrochemical impedance spectroscopy, linear polarization, anode polarization, and hydrogen diffusion coefficient measurements all indicate that the electrochemical kinetics property of the alloy electrodes is improved due to adding Pr in the as-studied alloys.

Keywords: Rare earth system hydrogen storage alloy; $AB_{3.5}$-type hydrogen storage alloy; MH electrode; Electrochemical properties; Electrochemical kinetics characteristics

稀土永磁材料的应用——非接触式电磁激振器的研制

于元东

摘 要：根据电磁原理研制出一种新的非接触式激振设备。其测试精度高、噪音低、结构简单。为小叶片的测振实验提供了一种新的激振方法。

本文介绍了导电（磁性或非磁性）试件激振的工作原理和性能特点以及该激振器的结构设计和磁路分析。

关键词 ：电磁 激振 磁路

Application of rare earth permanent magnet

——Non-contact exciter development

Abstract ： A non-contact exciter based on electromagnetic theory is developed. Test its high accuracy, low noise, simple structure. A new exciting technique is developed for vibration tests of small blade.

The principles, performance and characteristics of excited conductive plates (magnetic or non-magnetic materials) are illustrated in this paper.， as well as the structural design and analysis of the magnetic circuit.

Key word ： Electromagnetic exciting magnetic circuit

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异种稀土离子(Y3+、La3+、Gd3+)掺杂苯甲酸铽的光谱性能研究

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摘 要：本文采用共沉淀法得到了一系列异种稀土离子掺杂的苯甲酸铽固体化合物(Tb1-xREx(BA)3)。研究了其红外光谱、紫外吸收光谱和荧光光谱；测定了其在二甲亚砜中的电导率；探讨了荧光增强效应的机理。结果表明：掺杂离子对苯甲酸铽粉末和溶液荧光性能都有一定的增强作用；且增强效果随掺杂离子的不同而不同；异种离子与发光中心离子的半径差大小及形成异核结构的难易程度是荧光增强作用的主要影响因素。
关键词：共沉淀,掺杂,荧光,稀土,异核

Study on the spectrum performance of terbium-benzonic-acid complexes doped with the heterogeneous rare earth ion (Y^{3+}、La^{3+}、Gd^{3+})

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Abstract: In this paper, a series of terbium-benzonic-acid ($Tb_{1-x}RE_x(BA)_3$) complexes doped with heterogeneous rare earth ion was prepared by co-precipitation method. The complexes were analyzed by infrared spectrum, the ultraviolet absorption spectrometry and the fluorescence spectrum. The electrical conductivity of the complex in DMSO solution has been detected. The mechanism of fluorescence reinforcing has been investigated. The result showed that with the doping ion added in the complexes, the fluorescence intensity of the complexes were remarkable enhanced no matter the complexes were in the powder station and the solution of DMSO. Different ions show different enhancement effect on the complexes. The difference of the semidiameter between the heterogeneous ions and the center light-emitting ion and the new structures of the complexes were the main effect factors of the enhancement effect.
Key word: co-precipitation, doping, fluorescence, rare earth, different nucleus

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聚合活性 Eu(MAA)3phen 荧光配合物的合成与性能研究

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摘 要：以氧化铕为原料，甲基丙烯酸(MAA)为第一配体，邻菲罗啉(phen)为第二配体，采用共沉淀法合成了具有荧光性能的邻菲罗啉、甲基丙烯酸与Eu3+的三元配合物。通过红外光谱、XRD分析表明稀土离子参与了配位，生成的配合物具有良好的结晶性，元素分析的结果表明产物的化学组成为Eu(MAA)3phen。紫外光谱研究的结果表明，三元配合物中主要以配体phen吸收能量为主，紫外吸收为phen的π-π*跃迁特征，进一步证明了三元配合物的形成。荧光测试的结果表明，本文合成的三元配合物具有良好的发光性能。
关键词：共沉淀法，配合物, 荧光性能，稀土离子

Study on the synthesis and properties of polymerization activity fluorescent complexes $Eu(MAA)_3phen$

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Abstract: In this paper，a kind new ternary luminescent complex Eu^{3+}-methacrylic acid (MAA)-1,10-phenanthroline(phen) was synthesized by coprecipitation process. The Europium oxide was used as raw material. The complex was consists of two different ligands: one is carboxylate which is derived from methacrylic acid (MAA). The other is 1,10-phenanthroline which is found to be a critical component to make the complex exhibit desirable photophysical properties. The results of IR showed that the oxygen atoms from methacrylic acid and nitrogen atoms from phen coordinate to the rare earth ions in the complexes. The results of XRD showed the good crystalline performance of the complexes. The elemental analysis indicated that the chemical composition of the complex is $Eu(MAA)_3phen$. The main UV-vis absorption of the complex was the characteristic absorption of phen that was the π-π* electronic transitions of it. It showed the ternary luminescent complex was formed further more. The results showed that the synthesized complex has good luminescent property.
Keywords：Co-precipitation，Complexes, Luminescence, Rare-earth ions

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贮氢合金 La0.65Mg0.35Nix(x=3.0~3.5)高温电化学性能的研究

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摘 要：研究了La0.65Mg0.35Nix（x=3.0,3.1,3.2,3.3,3.4,3.5）稀土镁基贮氢电极合金的高温（60℃）放电性能，并采用动电位扫描和电化学P-C-T曲线测试对其进行了表征。该系列合金电极的高温荷电保持率随Ni含量的增加逐渐降低，x=3.1的合金具有较高的电化学容量（363.5mAh.g-1）。动电位扫描结果表明，随着A/B的增加，合金的抗腐蚀性能逐渐减弱；P-C-T曲线测试结果为高温放氢平台压力随着Ni含量的增加逐渐升高，说明Ni含量的增加不利于改善合金电极的高温放电性能。

关键词：RE-Mg-Ni系贮氢合金　高温　　腐蚀　P-C-T曲线

Investigation on electrochemical properties of $La_{0.65}Mg_{0.35}Ni_x$(x=3.0~3.5) at high temperature

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Abstract: High temperature discharge performances (60℃) of $La_{0.65}Mg_{0.35}Ni_x$（x=3.0,3.1,3.2,3.3,3.4,3.5）RE-Mg based hydrogen storage electrodes is investigated in this paper. Dynamic potential scanning and electrochemical P-C-T curve measurements characterize the high temperature properties of the alloy. The high temperature charge retention of such series alloy electrodes gradually decreases with increasing content of nickel. When X=3.1, the alloy has a higher electrochemical capacity (363.5mAh.g^{-1}). Dynamic potential scanning shows that the anti-corrosion properties of the alloy gradually decrease with increasing A/B ratio. And P-C-T curve shows that plateau pressure of hydrogen-discharge at high temperature rises with increasing content of nickel. The two results mean that increasing content of nickel is not favorable to improve the high temperature discharge properties of the alloy electrodes.

Key words: RE-Mg-Ni hydrogen storage alloys ; high temperature ; corrosion ; P-C-T curve

La0.65Mg0.35Nix(x=3.0~3.5)储氢合金电极自放电性能的研究

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摘 要：系统地研究了La0.65Mg0.35Nix(x=3.0~3.5)储氢合金的自放电性能，结果表明，随着Ni含量的增加，该系列合金电极的荷电保持率（室温静置72h）逐渐降低，其中，x=3.1的合金具有较高的放电容量（351. 2mAh.g-1）和荷电保持率（79.48%）。合金电极的电化学压力-组成-温度曲线(P-C-T曲线)表明，随Ni含量的增加，平台压力升高，与合金电极的荷电保持率的变化规律基本一致。通过合金电极极化曲线表明，x=3.0-3.4，合金电极的抗腐蚀性能逐渐降低,与合金电极的自放电性能的变化规律也基本一致。
关键词：储氢合金电极；自放电性能；荷电保持力；PCT曲线；腐蚀曲线

Investigation on the self-discharge of $La_{0.65}Mg_{0.35}Ni_x$(x=3.0~3.5) hydrogen storage alloy electrodes

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Abstract: In this paper, the self-discharge performances of $La_{0.65}Mg_{0.35}Ni_x$(x=3.0~3.5) hydrogen storage alloys were studied. Results show that, the capacity retention (set for 72h at room temperature) of hydrogen storage alloy electrodes gradually decreases with increasing content of nickel. The alloy electrodes, where x=3.1, have the maximum capacities (351.2mAh.g^{-1}) and capacity retention (79.48%). Electrochemical pressure-composition-temperature curves (PCT curves) indicate that plateau pressure ascends with increasing content of nickel in alloys, basically according with the change rules of capacity retention. Corrosion curves show that the corrosion property of the alloy electrodes gradually decreases when x is between 3.0 ~3.4, similar to self-discharge performances.

Key words: hydrogen storage alloy electrode; capacity retention; self-discharge performanc e; PCT curves; corrosion curves.

SiO2 包覆 Gd2O3: Er3+,Yb3+纳米粉的制备与结构及发光性能

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摘 要：用微乳液法合成出SiO2包覆的Yb3+，Er3+离子双掺杂的Gd2O3粉体，X射线衍射结果表明所制备粉体为立方Gd2O3结构。透射电镜照片显示其颗粒形状近似为球形，粒径为20～40nm；该粉体在波长为980nm的半导体激光器激发下发射出中心波长为562nm的绿色和660 nm的红色上转换荧光，分别对应于Er3+离子的4S3/2/2H11/2→4I15/2跃迁和4F9/2→4I15/2跃迁。发光强度和激发功率关系的研究揭示其均为双光子过程，能量传递和激发态吸收是上转换发光的主要机制。由于其具有高效的上转换发光性能，而经过纳米复合后制成的纳米Gd2O3（核）/SiO2（壳），容易溶于水并易于和有机物结合，能与生物分子结合。这对其应用于生物荧光标记领域具有广泛的意义。

关键词：纳米荧光粉；反相微乳液法；上转换发光；纳米核壳结构

Synthesis、Structure and Spectrum Properties of SiO_2 coating Gd_2O_3: Er^{3+}, Yb^{3+} Nanometer powder

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Abstract: Synthesizes SiO_2 gable Yb^{3+}, Er^{3+} with the microemulsion law the ion double doping the Gd_2O_3 powder body，The X-ray diffraction result indicated that prepares the powder body for the cubic Gd_2O_3 structure. The transmission electron microscope picture demonstrated that its grain shape approximate is a sphere, The particle size is 20~40nm; This powder body in the wave length is the 980nm semiconductor laser stimulates to after-crop projects the central wave length is the 562nm green and 660 nm on red transforms the fluorescence, Distinction correspondence in the Er^{3+} ion $^4S_{3/2}/^2H_{11/2}\rightarrow{}^4I_{15/2}$ jump and $^4F_{9/2}\rightarrow{}^4I_{15/2}$ jump. The luminous intensity and the exciting power relations' research promulgates it is the double photon process, The energy transfer and the excited state absorption are on transform the illumination the main mechanism. Because it has highly effective on to transform the illumination performance, But after passing through the nanometer compound, makes nanometer Gd_2O_3 (nucleus) /SiO_2 (shell), Easy to dissolve in the water and easy and the organic matter union, Can with the biological member union. This applies to it in the biological fluorescence mark domain has the widespread significance.

Key word: Nanometer luminous powder；reverse microemulsion law；On transforms the illumination,；Nanometer nuclear shell structure

YVO4·xTiO2：Eu3+荧光粉的发光性质研究

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摘 要：采用高温固相方法合成了YV O4 ·xTiO2:Eu 3+（x=0.1,0.2,0.3,0.,0.5,0.6,0.7,0.8,0.9）荧光粉，经X射线结构分析可以发现材料为两相共存。一相为YVO4，属四方晶系。另一相为Y2Ti2O7，属于立方烧绿石相。研究了YV O4 ·xTiO2:Eu 3+在UV及VUV激发下的光谱性质，讨论了Ti 的掺杂对发光性能的影响。发现适量的Ti的掺入可以提高材料基质的吸收。YV O4 ·xTiO2:Eu 3+荧光粉的发射主峰在616nm和619nm，证明Eu3+占据了非反演对称中心的位置。在YV O4 ·xTiO2:Eu 3+的激发谱中，有一中心位于155nm的吸收带，它属于基质的吸收带。

关键词：红色发光;PDP;VUV

A Study on Luminescence Properties of $YVO_4{\cdot}xTiO_2$：Eu^{3+}

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Abstract: The samples of YV O_4 ·$xTiO_2$:Eu $^{3+}$ (x=0.1,0.2,0.3,0.,0.5,0.6,0.7,0.8,0.9） were synthesized by the conventional solid state reaction.The structure of prepared sample was checked by X-ray diffraction at room temperature . XRD measurements confirmed that the prepared YV O_4 ·$xTiO_2$:Eu $^{3+}$ was consisted of two phases. One phase is YVO_4, belonged to the tetragonal according with JCPDS Card(42-0413),the other phase is $Y_2Ti_2O_7$, belonged to the cubic pyrochlore according with JCPDSCard (17-0341).Spectroscopic properties of sample was studied in the UV/VUV range.The effects of Ti iron on the luminenscent properties of sample was investgated and it was found that some Ti doped can highlight the absorption of matrix in UV/VUV rang.The emission spectrum was dominated by the red peaks at 616nm and 619nm due to the electric dipole transition $^5D_0 \rightarrow {}^7F_2$,Which indicates that Eu^{3+} occupies a site lacking inversion symmetry.There was one band centred at 155 nm in the excitation spectrum of sample may be assignted to the absorption of the host.

Key word: red lighting;PDP; VUV

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金属卤化物灯用高纯碘化镝绿色合成工艺的研究

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摘 要：碘化镝是一种重要的金属卤化物灯用发光材料，它可以发出密集的线状光谱，从而有效提高灯光效和显色指数，因此开展高纯无水碘化镝制备工艺的研究，对于获得优质的金卤灯产品具有重要意义。传统利用碘化汞和镝的置换反应合成碘化镝的方法由于所使用的原料碘化汞和置换反应产生的汞都是有毒物质，容易造成环境污染，已经不能很好地满足实际生产的需要。本文以金属镝和碘为原料，利用直接反应的方法合成了无水碘化镝。利用正交实验研究了温度对碘化镝合成产率和纯度的影响，从而确定了最佳的碘化镝合成工艺参数，XRD图谱表明在此条件下所合成的产物是单一的碘化镝相，化学分析结果表明产物的纯度达到了99.95%，产率达到了88%。此外还研究了碘过剩量对碘化镝产率的影响，并确定了最佳的碘过量比例为10%。

关键词：碘化镝，绿色合成，金属卤化物灯

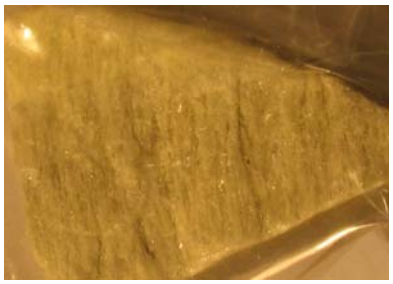


图 1 碘化镝实物图

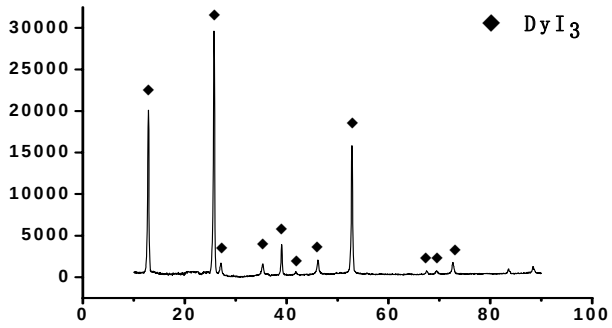


图 2 碘化镝的 XRD 分析结果

Study on Green Synthese Techniques of highly purified Dysprosium Iodide for HID Lamp

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Abstract : Dysprosium iodide (DyI_3) is an important luminescent material for HID lamps, which can emit intensive spectral lines, thus improves light efficiency and color rendering index of the lamp, so it is of great significance to achieve green synthesizing anhydrous Dysprosium iodide with high purity. The traditional synthesizing method of displacement reaction between mercury iodide and Dysprosium pollutes the environments because of the poisonous mercury iodide and mercury, and can't well satisfy the requirements of practical production. In this paper, using Dysprosium and Iodine as raw materials, anhydrous Dysprosium iodide was synthesized through direct reaction. The effect of reaction temperature on yield rate and purity of Dysprosium iodide was investigated through cross experiments, and the whole synthesizing procedure was optimized. The XRD pattern showed that the product synthesized under these conditions was single Dysprosium iodide, and the chemical analysis results showed that the purity and yield rate of the product reached 99.95% and 88% respectively. Additionally, the amount of iodine added for the reaction was also discussed; the optimal excess rate of iodine which was 10% was identified.

Key words: Dysprosium iodide, green synthese, HID lamp

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绿色荧光体 CaSc2O4:Ce3+的共沉淀合成

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摘 要：CaSc2O4：Ce3+由于发光强度强、稳定性好等特点，在白光LED用绿色光转换荧光材料的应用越来越引起重视。目前，文献关于CaSc2O4：Ce3+制备方法的报道均为高温固相法。高温固相法通常发光强度较高，但由于反应物中Sc2O3反应活性差，导致合成温度高、产物颗粒大而且粒径分布不均匀，给应用带来一定难度。为克服这一缺点，本文以廉价易得的硝酸钙[Ca(NO3)2]、硝酸钪[Sc(NO3)3]和硝酸亚铈[Ce(NO3)3]为原料，草酸为沉淀剂，用共沉淀法合成前驱体粉末，然后将前驱体粉末在5% H2+95% N2的还原气氛下煅烧，得到发光性能良好的CaSc2O4：Ce3+荧光粉。应用X射线粉末衍射（XRD）、荧光光谱（FS）、综合热分析（TG-DSC）和扫描电镜(SEM)等测试手段对前驱物及煅烧后的粉体进行表征。结果表明：烧结温度于800℃以上时,都可以得到正交结构的纯相CaSc2O4：Ce3+荧光体；荧光测试结果表明共沉淀法制备的CaSc2O4：Ce3+在450nm蓝光激发下，在510nm附近有最大发射，与高温固相法所得产品的发射波长相近。根据荧光粉发光强度，对荧光粉的合成条件进行了优化，得到Ce3+的最佳掺杂浓度为1 mol%，最佳煅烧条件为1100℃煅烧6h。最佳煅烧温度较传统的高温固相法（1600℃）低了约500℃，所得产品的发光强度接近高温固相法的产品。有望在CaSc2O4：Ce3+荧光粉的制备中更好地应用。

Synthesis of Green-Emitting Phosphor $CaSc_2O_4:Ce^{3+}$ by Co-precipitation Method

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Abstract: Ce^{3+}-activated $CaSc_2O_4$ with strong luminescence intensity and stable properties, has catched more and more attention as green phosphor for white-light LEDs. $CaSc_2O_4:Ce^{3+}$ has been preparated only with high-temperature solid state reaction by now. Although phosphor result from solid state reaction is satisfactory in luminescence intensity, directly application of the phosphor is difficult owing to their large particle size and low dispersity. In the present work, $CaSc_2O_4:Ce^{3+}$ precursors were first synthesized by a co-precipitation method from low-cost materials, in which solutions of calcium nitrate [$Ca(NO_3)_2$], scandium nitrate [$Sc(NO_3)_3$] and cerium nitrate [$Ce(NO_3)_3$] as mixed and precipitated with oxalic acid, and then heated in a 5% H_2 +95% N_2 atmosphere to get $CaSc_2O_4:Ce^{3+}$ phosphor. The phosphor was characterized with X-ray diffraction (XRD), fluorescence spectroscopy, TG-DSC and SEM. It was found that pure-$CaSc_2O_4$ phase with an

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orthorhombic structure can be obtained at firing temperature as low as 800℃; The phosphor gives strong green luminescence with a peak wavelength of 510 nm under excitation with a blue light at 450 nm. The emission wavelength conform to that of high-temperature solid method. Synthesis conditions were optimized according to the luminescence intensity. It was found that the optimized concentration for Ce^{3+} is 1 mol %. Samples fired at 1100°C for 6h give the strongest luminescene. Although the firing temperature is much lower than that of solid state reaction, the luminescence intensity of our product is only slight lower than the later, which means the present method is very promising in preparation of $CaSc_2O_4:Ce^{3+}$phosphor. .

La0.55Pr0.05NdxMg0.4-xNi3.3Al0.1(x=0.1-0.2)储氢合金高温电化学性能

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摘 要：系统的研究了Nd/Mg比对La0.55Pr0.05NdxMg0.4-xNi3.3Al0.1(x=0.1-0.2)储氢合金的高温电化学性能的影响。研究结果表明：在60℃工作条件下，合金中Nd/Mg比的增加,电极最大放电容量先升高后降低；合金中Nd/Mg比的增加对合金的循环寿命没有改善，从腐蚀曲线看出Nd/Mg比增加导致合金腐蚀电流增大循环寿命降低。

关键词：AB3-3.5型储氢合金；高温电化学性能；腐蚀电流

High temperature electrochemical properties of $La_{0.55}Pr_{0.05}Nd_xMg_{0.4-x}Ni_{3.3}Al_{0.1}$(x=0.1-0.2) hydrogen storage alloy

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Abstract: Influence of Nd/Mg ratio on the high temperature electrochemical properties of $La_{0.55}Pr_{0.05}Nd_xMg_{0.4-x}Ni_{3.3}Al_{0.1}$(x=0.1-0.2) hydrogen storage alloy is systematically investigated in the paper. Research result shows that under the working condition of 60℃, the maximum discharge capacity of the electrode ascends firstly and descends afterwards with increasing ratio of Nd to Mg in the alloy, and increasing Nd/Mg ratio in the alloy does not improve the cycle life of the alloy. From corrosion curve we can see that increasing Nd/Mg ratio increases corrosion current and accordingly reduces the cycle life of the alloy.

Key words: $AB_{3-3.5}$ hydrogen storage alloy high temperature electrochemical property corrosion current

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LuAG:Pr3+透明陶瓷的制备及光谱性质研究

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摘 要：近年来，由于高能物理和核医学诊断的不断发展促进了人们研究、开发具有高密度、快衰减、高光产额、高稳定性以及高抗辐照性能的新型闪烁体材料。其中，透明陶瓷闪烁体克服了单晶生长成本高，耗时，掺杂浓度低，尺寸大小受限等缺点，同时其光学性能接近或超过了相应的单晶产品，成为近年闪烁体领域的研究热点。目前，对Ce3+掺杂的闪烁体研究最为活跃和成熟，而对同样具有5d-4f跃迁的掺Pr3+和Nd3+的闪烁体研究报道很少，且限于单晶。因此，本文选择掺Pr3+的LuAG石榴石作为研究对象，详细描述了纳米粉末及透明陶瓷的制备过程，测量了样品在紫外和真空紫外的光谱（VU-VUV），并首次报道了Pr3+在LuAG粉末和陶瓷中的猝灭浓度。

本文选用碳酸氢铵为沉淀剂利用共沉淀法制备了不同掺杂浓度的LuAG:Pr3+纳米粉末，在未使用任何添加剂的情况下选取合适的前驱粉末利用真空和氮气气氛相结合的烧结方法得到了透明陶瓷。用X射线衍射对不同温度下热处理的粉末样品进行结构表征，发现900℃以下热处理的粉体为无定形态，900℃时开始出现LuAG立方相的衍射峰，1000℃时已经完全成相，其X衍射峰与标准谱匹配，继续加热到1100℃，除峰值强度增加半高宽变窄外，没有出现其他衍射峰。用TEM分析了1000℃煅烧2h粉末的显微结构和形貌并利用SEM测量了未抛光陶瓷样品的表面形态。

研究了LuAG:Pr3+粉末和陶瓷样品在VU-VUV波段的激发和发射光谱。LuAG:Pr3+的主要发射来源于Pr3+的5d-4f跃迁，主发射峰位于310nm左右，可指认为5d-3H4跃迁，360nm附近的次峰为5d-3Fx跃迁。粉末和陶瓷样品的发射光谱相似但陶瓷样品的发射光谱强度明显强于粉末样品，且发射光谱整体红移（主发射峰红移约为3nm）。监测波长为310nm的5d-4f发射时，陶瓷样品中的峰值为240nm、285nm的两个带谱对应于Pr3+ 4f2 (3H4)→5d1,2跃迁，159nm的吸收带被指认为基质吸收，170nm带是由LuAl反位缺陷引起。对于粉末样品，它的基质吸收强于Pr3+吸收并且高于陶瓷的基质吸收。此结果意味着在纳米粉末中，从基质到Pr3+ 4f5d能带的能量传递效率相对更高。同时，由于反位缺陷在高温烧结过程中才会出现，粉末中没有170nm的带。

本文报道了LuAG:Pr3+纳米粉末和透明陶瓷中光谱强度与Pr3+浓度的依赖关系，发现陶瓷与纳米粉末中Pr3+的猝灭浓度分别为1.0%和3.0%。这一结果远远高于LuAG:Pr3+和LuGG:Pr3+单晶中最佳掺杂浓度0.24%和0.3%，体现了透明陶瓷材料的极大优势。

Synthesis and Luminescent Properties of Pr-doped $Lu_3Al_5O_{12}$ Translucent Ceramic

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Abstract: Due to the demand of high-energy physics and nuclear medical imaging, research into and development of inorganic scintillators with high light yield, short decay time, and high stopping power is very active in recent decades. However, transparent ceramic as a substitute for single crystal gradually becomes the focus in the field of scintillator materials because of several advantages, like lower-cost and shorter manufacturing period, higher concentration and better dispersion of doped ions, easiness in fabrication of desired shape and size. Up to now, Ce-activated materials with excellent qualities are actively studied but other ions with allowed 5d-4f transitions, like $Pr^{3+}$and Nd^{3+}, are comparatively less studied and always limited to single crystal. Here, we report the synthesis approach and spectroscopic properties in VU-VUV range of Pr^{3+} in LuAG powders and ceramics. The concentration effect on the luminescence properties of LuAG:Pr^{3+} ceramics also has been firstly investigated and compare with the respective nanopowder used to fabricate ceramics.

Lutetium aluminum garnet (LuAG) precursors doped with different Pr^{3+} concentration (0.25, 0.5, 1.0, 3.0, 5.0%) were synthesized via a co-precipitation method, using ammonium hydrogen carbonate as precipitant. The phase evolution and morphology of the precursor during calcinations were characterized by XRD and TEM. The resultant LuAG:Pr^{3+} powders were sintered into translucent ceramics in vacuum at 1150℃ and then in nitrogen at 1700℃. SEM photograph shows the microstructure of unpolished LuAG:Pr^{3+} ceramic. It can be clearly seen that the precursor remains amorphous below 900℃, and crystallization peaks begin to appear above this temperature. Calcining to 1000℃ resulted in complete transformation to LuAG and all diffraction peaks are well consistent with JCPDS No.73-1368. Further heating of the precursor to 1100℃ revealed an increase in intensities and continued refinement of peak shapes without emergence of other phases.

The VU-VUV photoluminescence spectrum were measured. The form of ceramic emission spectra, when normalized the dominant emission, was found to have no obvious difference with nano-powder in addition to integrated red shift. The dominant emission band peaking at 310 nm and another emission band round 360 nm originate from the lowest 5d sub-band to $^3H_4$ and ^3F_x 4f

states respectively. The excitation spectra monitoring 310 nm emission consists of two intensive broad bands peaking at 240, 285 nm which correspond to the Pr^{3+} $4f^2$ ($^3H_4$)→$5d_{1,2}$ transitions. The weaker band around 159 nm and 170 nm can be ascribe to host absorption and antisite defect (Lu_{Al}). For the powder sample, the host absorption band is more intensive than Pr^{3+} 4f-5d absorption, as well as host absorption band of LuAG:Pr^{3+} ceramic, but the antisite defects absorption band positioned around 170 nm diminished.

The PL spectrum (λ_{ex} = 240nm) varying with the concentration of Pr^{3+} were firstly measured in LuAG nano-powder and ceramics. The quenching concentration of nanocrystalline LuAG:Pr^{3+} is about 3.0% higher than that of ceramics 1.0%. According to the previous studies the optimum concentration Pr^{3+} for both LuAG and LuGG single crystal respectively is about 0.24% and 0.3 at.%. This is a fascinating property to fabricate transparent ceramics to substitute single crystals.

Ca/Sr 对(Sr2-xCax)MgSi2O7:Eu2+,Dy3+发光性能的影响

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摘 要：使用高温固相法制备了不同Ca/Sr的(Sr2-xCax)MgSi2O7：Eu2+，Dy3+长余辉材料发光材料，用X射线粉末衍射表征该材料的相组成，用发射光谱、初始亮度和余辉时间对材料的发光性能进行表征。结果表明：Ca/Sr不仅能影响材料的发射光谱，而且还影响材料的初始亮度和余辉时间，随Ca/Sr（x值）增大，该类材料的发射光谱红移，余辉时间逐渐变短，而初始亮度值先变大后变小，当Ca/Sr为1时，材料的发光性能最好，这可能和材料具有合适深度的陷阱有关。

关键词：长余辉，硅酸盐，高温固相法, Ca/Sr
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Effect of Ca/Sr on Luminescent properties of $(Sr_{2-x}Ca_x)MgSi_2O_7:Eu^{2+},Dy^{3+}$

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Abstract: Long afterglow phosphor with vary Ca/Sr ratio were prepared under a reduction atmosphere by solid state reaction method. The obtained phosphor compositions were characterized for their phase by X-ray diffraction (XRD).Photoluminescence (PL) properties were invested measuring emission spectra, initial brightness and afterglow time for varying Ca/Sr ratio. With increasing Ca/Sr ratio，the red shift in the luminescence properties of phosphor is shown in the PL results, the initial brightness develops firstly and then drops, the afterglow time decreases. When the Ca/Sr ratio is 1, the luminescent property is best. It is may ascribed to the traps with proper depth.

Key words: long afterglow, silicate, solid-state reaction, Ca/Sr ratio

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基质组分对 YAG:Ce3+黄色荧光粉的性能影响研究

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摘 要：以氧化铝、自制的钇铈复合氧化物为原料，按不同的钇铝比进行配分，并加入一定量的助熔剂，经高温合成得到不同基质组分的 YAG:Ce^{3+}黄色荧光粉。研究了不同基质组分对荧光粉的发光性能、形貌、粒度分布的影响。用 XRD 对荧光粉的物相进行了分析；用 SEM、激光粒度分析仪分析了荧光粉的形貌和粒度分布；用 460nm 蓝光激发 YAG:Ce^{3+}荧光粉得到黄光，与蓝光混合得到白光，并测定了其发射光谱。结果表明，YAG:Ce^{3+}中钇铝比为 3/6 时，荧光粉的发光强度最高，形貌规则、粒度分布均匀。

关键词：YAG:Ce^{3+}；固相法；钇铈复合氧化物

The effect of matrix composition on the performance of YAG:Ce^{3+} phosphor

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Abstract Phosphor YAG:Ce^{3+} with different yttirum-aluminium ratio were synthesized from alumina, complex of ceria and yttria and some flux by high-temperature solid-state reaction under reducing atmosphere.The effact of matrix with different component on luminescence capability,morphology,particle size distrabution was reserched.XRD was used to check the phase of the phosphor.SEM was used to analyze the morphology. The particle size distrabution of phosphor also was analyzed.Yellow light was got by excitation of YAG:Ce^{3+} with blue light,and the white light was got by mixing the yellow light and blue light. The results showed that when yttirum-aluminium ratio of YAG:Ce^{3+} was 3/6 ,the phosphor had the best luminescence intensity, regular morphology,and uniform particle size distrbution.

Key words： YAG:Ce^{3+} ； Solid-state method； yttrium-cerrium mixed oxide

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[Emim]n[Xn-] (X= PF6-, AsF6-, SbF6-, NbF6-, TaF6-, LaCl63-)离子液体结构和光谱的理论研究*

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摘 要：离子液体是由特定有机阳离子和阴离子构成的，在室温或近于室温下呈液态的离子体系。它具有熔点低，无明显蒸汽压，不易燃，不挥发和电化学窗口宽等优点, 已经广泛应用于有机合成、催化、材料、化工、萃取分离以及金属电沉积等领域。但是目前对离子液体的结构认识尚处于初步阶段，还有许多问题需进一步研究。通过量子化学方法探索离子液体离子对的稳定构型、相互作用等微观结构和光谱性质，进而模拟和预测液态下离子液体的结构和宏观实验性质之间的关系,对离子液体结构和性质的研究可以为人们进一步认识和应用离子液体提供充分、准确的数据，具有重要的科学意义。本文应用密度泛函理论的B3LYP/6-31g(d)方法研究了阳离子[Emim+]与PF6-、AsF6-、SbF6-以及稀有金属氟化物NbF6-、TaF6-，稀土金属氯化物LaCl63-等阴离子形成的离子液体结构、红外和Raman光谱，分析阴阳离子及其构成离子液体分子的电荷分布，阴阳离子的结合方式及其相互作用所得计算结果与实验观测值符合得较好。本文的研究结果对理解新型稀有金属室温熔盐的结构和性质具有重要意义。

Theoretical Study on the Structure, Spectrum and Hydrogen Bonds of the Ionic Liquid $[Emim]_n[X^{n-}]$ (X= PF_6^-, AsF_6^-, SbF_6^-, NbF_6^-, TaF_6^- and $LaCl_6^{3-}$)

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Abstract: Ionic liquids which are liquids at ambient temperature, are completely composed of anions and cations. They have many attractive properties, such as such as low melting points, negligible vapor pressure, nonvolatile, nonflammable, wide electrochemical windows and have been widely and successfully applied many fileds such as organic synthesis, catalysts, materials, chemical engineering, extraction and electrodepostion of metals. Science the structural properties are the key points to understanding the thermodynamic, dynamic, and other properties of ionic

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liquids, it is very important to understand the structural properties of ionic liquids. In the paper, a series of complex anions such as PF_6^-、AsF_6^-、SbF_6^-，rare metal fluorides NbF_6^-、TaF_6^-，and rare earth metal chloride $LaCl_6^{3-}$ and the ionic liquids formed by these anions and 1-ethyl-3-methylimidazolium are studied by the density functional theory at B3LYP/6-31G(d) level. The geometry structure, IR spectra, charge distributions of anions and ionic liquids as well as the interactions between cation and anions of ionic liquids are obtained and analyzed. The calculated results for thoese ionic liquids agree well with the experimental results.

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重稀土元素 Gd 对烧结 Nd15Fe77B8 微观组织及性能的影响

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摘 要：本文研究了重稀土元素Gd（0-15%质量分数）取代烧结Nd15Fe77B8磁体中Nd后磁体的微观组织及磁体的综合性能。结果表明：当取代元素Gd的质量分数控制在（0-1%）的时候，磁体的综合性能最高；取代元素Gd的质量分数控制在（1%-10%）时，磁体的性能出现下降，但存在综合经济效益，降低了成本，可生产低牌号的磁体；当取代元素Gd的质量分数大于10%时，磁体性能下降明显，综合经济效益也显著下降。

关键字：微观组织　磁体性能 烧结钕铁硼　元素Gd

Effect of Gd on Microstructure and Magnet Properties of Sintered Nd-Fe-B

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Abstract: The effect of Gd(0-15wt%) on microstructure and magnet properties of sintered $Nd_{15}Fe_{77}B_8$ was studied.The results show that excellent magnet performance can be obtained by adding Gd（0-1wt%）instead of Nd,the microstructure is close to ideal structure with Gd（0-1wt%）; the magnet performance dropped by adding Gd（1-10wt%）instead of Nd,but it can be used for magnet(N35-N40)beacause of

the price of Gd much cheaper than Nd;more than 10% instead of Nd,the magnet performance decreased sharply.

Key words: microstructure magnet performance sintered $Nd_{15}Fe_{77}B_8$　Gd

YVO4:Eu3+的 EDTA 络合溶胶-凝胶法制备、发光及其在 LEDs 中的应用

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摘 要：以金属硝酸盐、偏钒酸铵和乙二胺四乙酸(EDTA)为原料，用EDTA络合溶胶-凝胶法合成了红色荧光粉YVO4:Eu3+。用差热-热重仪(TG-DTA)对干凝胶的热分解过程进行了分析，并利用X-射线粉末衍射(XRD)、扫描电镜(SEM)、光致发光(PL)等对荧光粉进行了表征。TG-DTA结果显示，反应前驱体在600 ℃左右分解完全；XRD结果表明，在较低温度(650 ℃)下可以制备纯相YVO4:Eu3+荧光粉；SEM照片显示，产物的形貌均为类八面体；PL结果(图1、2)表明，EDTA络合溶胶-凝胶法制备的荧光粉的激发光谱和发射光谱均类似于高温固相法制备的产物；用396 nm光激发时，650 ℃灼烧所得样品的发射谱峰值与高温固相法(950 ℃)的相近。将荧光粉封装在InGaN近紫外芯片(λem = 395 nm)上制作了LED器件，测定了器件的电致发光光谱、色坐标等参数(图3)。

Synthesis and photoluminescence of $YVO_4:Eu^{3+}$ via EDTA sol-gel method and its application in LEDs

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Abstract: Red-emitting phosphor $YVO_4:Eu^{3+}$ powders were synthesized by the EDTA sol-gel method with the raw materials of corresponding metal nitrates，ammonium metavanadate and ethylenediaminetetraacetic acid (EDTA). The thermal decomposition process of xerogel were studied using themogravimetric analysis (TG-DTA), and the prepared $YVO_4:Eu^{3+}$ phosphors were characterized by X-ray powder diffraction (XRD), scanning electron microscope (SEM) and photoluminescence (PL). The TG-DTA results show that the precursor decomposes completely at about 600 ℃. The XRD results show that the pure phase phosphors can be prepared at a relatively low temperature (650 ℃). The SEM images reveal that the morphologies of the products are octahedron-like. The PL results (Fig. 1 and 2) indicate that the excitation and the emission spectra of the phosphors obtained with the EDTA sol-gel method are very similar as those of the phosphor obtained with

high-temperature solid method. Upon exciting with UV light of 396 nm, the emission intensities of the phosphor obtained with the sintering tempature of 650 ℃ are very close to those of the latter. Red LEDs were fabricated by InGaN chip (λ_{em} = 395 nm) and YVO_4: Eu^{3+} phosphors by high-temperature solid method and sol-gel method at sintering temperature 650 ℃, respectively. And the electroluminescence spectra and the CIE parameters were measured and shown in Fig. 3.

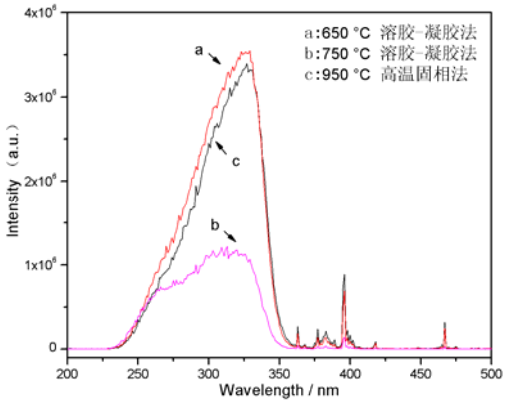


图 1. YVO_4:Eu^{3+}的激发光谱

Fig.1 Excitation spectra of YVO_4:Eu^{3+}

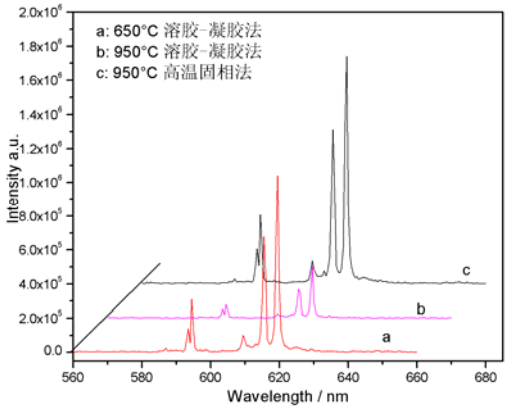


图 2. YVO_4:Eu^{3+}的发射光谱(λ_{ex} = 396 nm)

Fig.2 Emission spectra of YVO_4:Eu^{3+}(λ_{ex} = 396 nm)

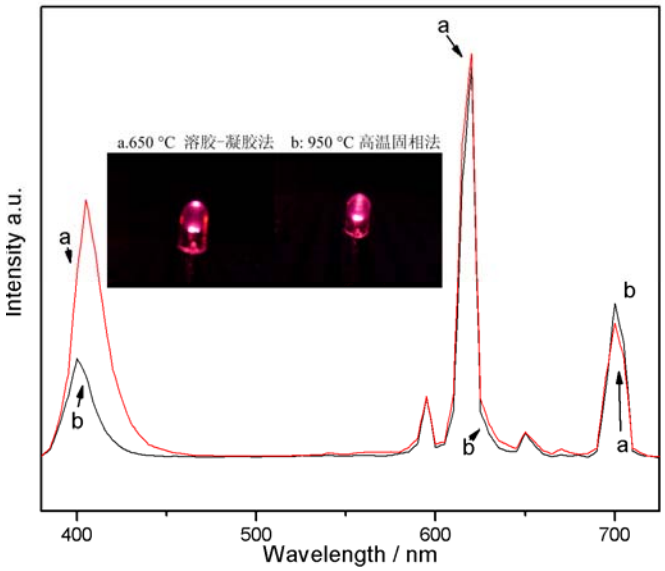


图 3. LED 的电致发光光谱

Fig.3. The electroluminescent spectra of the LEDs

稀土改性纳米 TiO2/羟基硅油 ERF 的电流变性能研究

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摘 要：制备了纳米二氧化钛、Eu2O3和La2O3分别改性纳米TiO2与羟基硅油匹配成的电流变液（ERF），通过TEM、能谱、X衍射等对改性纳米TiO2结构进行了表征。原TiO2为棒状结构，长约100nm，直径约为20nm，稀土离子不仅可以固溶形式进入TiO2晶体，还可以包裹在TiO2表面，使TiO2变成无定型态，平均粒径约为100~150nm，利于与羟基硅油接触和反应。在60Hz时介电常数ε由纯TiO2的3.25增加为Eu2O3改性TiO2的5.5，增大了0.7倍，不同稀土改性提高ERF的ε数值不同。三种ERF的粘度随电场增大而增大的趋势相近，都存在临界电场强度E0（2 KV/mm），在3.5 KV/mm时的粘度（Pa.s）,三者顺序分别为4500、4700和6340。随电场增强ERF剪切应力增大，其中含Eu比La提高得更多;在剪切速率为10s-1下，含纯TiO2 ERF的剪切应力由0 V/mm的 50Pa增至3 KV/mm得200Pa，而Eu2O3改性TiO2则由由0V/mm的100Pa增至3 KV/mm得800Pa。

关键词：电流变液； 稀土改性；纳米TiO2；羟基硅油；表征与性能

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The research on ER Properties of nanometer titanium dioxide modified by rare earth /hydroxyl silicone oil

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Abstract:ERFs were prepared by reactions between hydroxyl silicone oil and nanometer titanium dioxide, nanometer titanium dioxide modified by Eu_2O_3, nanometer titanium dioxide modified by La_2O_3,respectively.The structures of modified nanometer titanium dioxide were characterized by TEM, energy spectrum and x-ray diffraction. Pure nanometer titanium dioxide was rodlike and diameter was about 20nm.Rare earth ions not only entered the inner structure of TiO_2 in the form of solid solution, but also coated TiO_2 in the form of oxide,so the TiO_2

became amorphous and average particle size was about 100~150nm. Dielectric constant (ε) of TiO_2 was 3.25 and dielectric constant ε of TiO_2 modified by Eu_2O_3 was 5.5 when frequency was 60Hz ,the ε of TiO_2 modified by different rare earth was different. The viscosity of three kinds of ERF increased with the increasing of electric field intensity and there were critical electric field(2 KV/mm).When in 3.5 KV/mm electric field, the viscosities (Pa.s) were 4500,4700,6340,respectely. The shear press of three kinds of ERF increased with the increasing of electric field intensity and ERF containing Eu increased more bigger than ERF containing La. When the shear rate was 10s-1,the shear press of ERF of TiO2 become 200 Pa in 3 KV/mm electric field from 50Pa in 0 KV/mm electric field,but he shear press of ERF of TiO2 modified by Eu2O3 is 200 Pa in 3 KV/mm electric field from 50Pa in 0 KV/mm electric field

Key words: electro-rheological fluid;modified by rare earth ; nanometer titanium dioxide ; hydroxyl silicone oil; characterization and Properties.current variable liquid(0)
electro rheological fluids(0)

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纺锤状 NaEuF4 纳米粒子的水热合成

王志俊

摘 要：本文通过一种简单的水热方法合成出了长约500nm宽约150nm的纺锤状NaEuF4纳米粒子。该粒子两头窄中间宽。X射线衍射、投射电子显微分析和选区电子衍射分析表明该纳米粒子结晶性较好，形貌规则。在室温下用FLUOROLOG-3-TAU稳态荧光光谱仪来研究其发光现象。结果表明该物质可以发出很强的橙光和红光。

Hydrothermal Synthesis of $NaEuF_4$ Spindle-like Crystalline Particles

Abstract:$NaEuF_4$ spindle-like crystalline particles with length of about 500 nm by width of around 150 nm have been synthesized through a simple hydrothermal method. The width of the samples increases from the ends to the center.The particles are well-crystallized and exhibit fine morphology, as indicated by X-ray diffraction, transmission electron microscope and selected area electron diffractometer. The luminescence properties of these $NaEuF_4$ product are investigated with a FLUOROLOG-3-TAU steady-state/lifetime fluorescence spectrometer at room - temperature. Strong orange and red light emission is observed from room – temperature emission spectrum of $NaEuF_4$ spindle-like particles.

预烧温度对 Ba4Sm28/3Ti18O54 微波介质陶瓷材料性能的影响

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摘 要：以Ba4Sm28/3Ti18O54微波介质陶瓷材料为对象，通过XRD，SEM等测试方法研究不同预烧温度对其烧结性能、晶体结构和微波介电性能的影响。结果表明：适当的预烧温度能提高材料的致密度并改善其介电性能。当预烧温度为1050℃时，能得到介电性能较佳的微波介质陶瓷，1MHz下εr≈80， tanδ≈1×10-4；微波频率下εr≈80，Q•f=9230GHz(3.97 GHz)，τf＝－17ppm/℃。

关键词：微波介质陶瓷；介电性能；预烧温度

Influence of different pre-sitering temperature on properties of $Ba_4Sm_{28/3}Ti_{18}O_{54}$ microwave dielectric ceramic

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Abstract: The sintering behavior crystal structure and microwave dielectric properties of $Ba_4Sm_{28/3}Ti_{18}O_{54}$ microwave dielectric ceramic in different pre-sitering temperature were systematically investigated by XRD、SEM. The result show proper pre-sitering temperature could improve the dielectric property of material. When the pre-sitering temperature was 1050℃, the dielectric properties were better: ε_r≈79, $tan\delta$≈1×10^{-4} (1MHz); ε_r≈80 , Q•f=9230GHz(3.97GHz), τ_f= －17ppm/℃.

Keywords: microwave dielectric ceramics; dielectric properties; pre-sitering temperature

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溶胶-凝胶法在玻璃基上制备 CeO2-TiO2 紫外吸收膜层的研究

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摘　要：分别以Ce(NO3)3·6H2O和Ti(OC4H9)4为前驱体制备CeO2和TiO2溶胶，通过改变Ce/Ti摩尔比(Ce/Ti=0/10;1/9;2/8;3/7;4/6;5/5;6/4;7/3;8/2;9/1;10/0)得到一系列混合溶胶，然后采用提拉法在玻璃基片上制备了CeO2-TiO2紫外吸收膜层。利用紫外-可见光谱，XRD，FTIR, SEM对各溶胶以及溶胶制得的薄膜的进行了表征。结果表明，CeO2和TiO2相互作用，拓展了各自的光响应范围，并且有助于表面分散，减小生成CeO2微晶的尺寸，膜层有Ce-O-Ti的键生成，随着氧化物薄膜中CeO2含量的增加，TiO2表面禁带内-0.8eV及+1.5eV附近增加了新的表面能级，混合溶胶及其膜层的紫外线吸收能力强于纯的CeO2和纯的TiO2，吸收曲线向长波方向移动，从而起到屏蔽紫外线的作用，。当薄膜达到一定厚度的时候，紫外线几乎全部被截止，膜层越厚截止效果越好，且对可见光区域的透过率基本无影响，均在78%~85%；。同时研究了薄膜的物相结构、表面组成与形貌。

关键词：CeO2-TiO2，紫外吸收，溶胶-凝胶法

Studies of CeO2-TiO2 UV-shielding thin films deposited on glass substrates by Sol-gel process

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Abstract: A series of CeO_2-TiO_2 sols were prepared with different molar ratio of CeO_2 to TiO_2 (Ce/Ti=0/10;1/9;2/8;3/7;4/6;5/5;6/4;7/3;8/2;9/1;10/0)which were obtained by different precursors ($Ce(NO_3)_3·6H_2O$ and $Ti(OC_4H_9)_4$)respectively. CeO_2-TiO_2 UV-shielding coatings were deposited on glass by the dip-coating method. The properties of sols and films were characterized by Uv-Vis, XRD, FTIR, SEM. The results show that coupling CeO2 with TiO2 extends the optical absorption from UV to visible region, and TiO2 can promote the dispersion of CeO2 on silica and diminishes the size of microcrystalline CeO_2. Ce-O-Ti bridges are formed, and with the increasing of the ratio of CeO2, the TiO2 nanometer powders may appear new energy levels near the scope of -0.8eV and +1.5eV in the surface band-gap. The mixed sols have high ultraviolet absorption compare with pure CeO_2 sol and pure TiO_2 sol, The absorbing capacity of films become better with the increasing of the thickness of the films, and the transmission in the visible light region has not changed , which is about 78%~85. Meanwhile, the structure, surface composition of the films and SEM were also studied by XRD , FTIR, XPS.

Keywords: CeO_2-TiO_2, UV-absorbing coating, sol-gel

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基于 NMR 的代谢组学对腹腔注射稀土 Pr(NO3)3 后大鼠肝组织提取物的研究

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摘 要：近年来，生物组织提取液的高分辨核磁共振氢谱结合模式识别的代谢组学方法在药物毒性、环境毒理和疾病诊断研究等方面具有越来越广泛的应用[1~4]。稀土由于其特殊的电子层结构在工业、农业、畜牧业和现代生物医学上具有非常广泛的应用。本部分工作采用模式识别中的主成分分析(PCA)方法分析了腹腔注射稀土硝酸镨(2，10，50 mg/kg体重)后大鼠肝脏极性提取物的1H NMR谱图数据，研究了稀土镨对大鼠肝脏中代谢物浓度变化的影响。

对给药Pr(NO3)3组和对照组大鼠肝脏提取物1H NMR谱图进行PCA分析后发现，除2 mg/kg体重组样本和对照组样本没有明显分类外，10 mg/kg体重组给药96 h后和50 mg/kg体重组给药后3个时间点(48，96和168 h p.d.)样本与对照组样本均有清晰的分类(ANOVA, $p<0.05$)。主成分装载图显示，50 mg Pr(NO3)3/kg体重组大鼠肝组织中对PCA分类作出贡献的代谢物包括：葡萄糖浓度降低，乳酸、丙氨酸、乙酸、谷氨酸、谷氨酰胺、丙酮酸、肌酸、胆碱类化合物(胆碱、磷酸胆碱和甘油磷酸胆碱)、TMAO、甜菜碱和牛磺酸浓度升高。10 mg Pr(NO3)3/kg 体重组中，大鼠肝组织中葡萄糖含量的降低及甘油磷酸胆碱、TMAO和甜菜碱的升高与50 mg/kg体重组相似，但乳酸、谷氨酸、丙酮酸和胆碱含量在10 mg/kg剂量组降低，而不是升高。研究表明：2 mg/kg体重剂量的硝酸镨对大鼠肝脏造成的影响不甚明显；10和50 mg/kg体重剂量的硝酸镨能够影响机体的糖代谢和脂质代谢过程，且10 mg/kg体重组和50 mg/kg体重组对机体能量代谢的影响有所不同。

Investigation on the $Pr(NO_3)_3$-treated rats by NMR-based Metabolic Profiling of liver tissue extracts

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Abstract: In recent years, pattern recognition combined with high resolution ^{1}H NMR spectroscopy of tissue extracts has been widely applied to the diagnosis of inborn diseases, toxicity of medicines and environmental toxicology. Because of the special atomic structure, rare earths are substantially used in industry, agriculture, stock raising and modern biomedicine fields. In this study, male Wistar rats were treated with various doses of $Pr(NO_3)_3$ (2, 10 and 50 mg/kg body weight, intraperitoneal injection). Liver tissue samples from $Pr(NO_3)_3$-treated and control rats were collected at 48, 96 and 168 hr p.d., and extracted using methanol/chloroform solvent system. High resolution ^{1}H NMR spectra of aqueous soluble liver tissue extracts were analyzed by pattern recognition using principal components analysis (PCA).

PC scores plots illustrated that there were remarkable differences (ANOVA, $p<0.05$) between control and groups of higher doses (10 and 50 mg/kg body weight) of $Pr(NO_3)_3$-treated rats. No obvious differences were observed between control and 2 mg $Pr(NO_3)_3$/kg-treated rats. The corresponding PC loadings plots showed that 50 mg/kg body weight of $Pr(NO_3)_3$ caused decreased glucose and increased lactate, alanine, acetate, glutamine, glutamate, pyruvate, choline, phophocholine, glycerophosphocholine, TMAO, betaine and tautine concentration in liver. In the 10 mg $Pr(NO_3)_3$/kg body weight groups, the variations of liver glucose, glycerophosphocholine, TMAO and betaine levels were the same as those in 50 mg/kg groups; The levels of lactate, glutamate, pyruvate and choline were reduced in 10 mg/kg groups, which changed in an opposite way as in 50 mg/kg groups. Results from NMR-based metabonomic analysis of liver tissue extracts from rats suggested that higher dosage praseodymium could cause disorders of glucose metabolism and lipid metabolism on rats. The NMR-based metabonomic methods can also be used to evaluate the toxicities of other compounds.

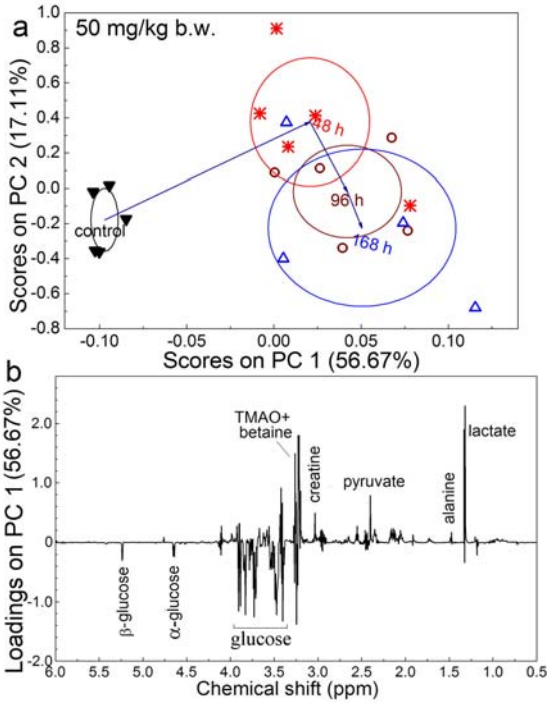


Fig. 1 对照组和腹腔注射 50 mg $Pr(NO_3)_3$/kg 体重组(48，96 和 168 h)大鼠肝组织提取物 ^{1}H NMR 谱图数据的 PC 得分(a)和装载图(b)。▼，对照组； *，48 h p.d.；○，96 h p.d.；△，168 h p.d.

Fig. 1 PC scores (a) and loadings (b) plots from the analysis of ^{1}H NMR spectra of aqueous liver extracts from 50 mg $GdCl_3$/kg body weight treated rats. ▼, control; *, 48 hr p.d.; ■, 96 hr p.d.; ＋, 168 hr p.d.. Ellipses represent mean ± SD for each group.

Ni50Mn25+xGa25-xTb0.5(x=0,1.5,3,4.5,6)合金马氏体相变与磁性能

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摘 要：制备了Ni50Mn25+xGa25-xTb0.5 (x= 0,1.5,3,4.5,6)磁性记忆合金，研究了其马氏体相变行为、磁感生应变和饱和磁化强度。结果表明，Mn含量增加和Ga含量降低，使得合金的马氏体相变温度从202K升高到416K，磁感生应变达到0.1870%，饱和磁化强度从700mT降低到400mT。

关键词：Ni50Mn25+xGa25-xTb0.5合金；马氏体相变；磁感生应变；饱和磁化强度

Martensitic transformation and magnetic properties of $Ni_{50}Mn_{25+x}Ga_{25-x}Tb_{0.5}$ (x=0,1.5,3,4.5,6) alloys

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Abstract: Martensitic transformation, magnetic-field-induced strain and saturation magnetization of $Ni_{50}Mn_{25+x}Ga_{25-x}Tb_{0.5}$ (x= 0,1.5,3,4.5,6) magnetism memory alloys were measured .The transformation temperature is improved from 202K to 416K, magnetic-field-induced strain is improved to 1870ppm,and its saturation magnetization goes down fast from 7KGs to 4 KGs as the content of Mn increases and the content of Ga decreases.

Key words: $Ni_{50}Mn_{25+x}Ga_{25-x}Tb_{0.5}$ alloy，martensitic transformation，magnetic-field- induced strain，saturation magnetization

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铥-酶修饰电极在电催化中的应用

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摘 要：用电化学方法来研究蛋白质和酶的电子传递过程引起化学工作者的广泛关注。血红蛋白（Hb）是脊椎动物血红细胞的呼吸蛋白，是血液中运输氧气的主要物质。血红蛋白在裸电极上过电位很大很难发生还原反应，一般采用在电极表面修饰媒介体或加入促进剂的方法。稀土铥离子具有弱的荧光性，属于重稀土。本文采用采用氯化铥来修饰血红蛋白和葡萄糖氧化酶电极，研究其直接电化学和生物催化能力。

1 Tm/Hb/nafion/GC修饰电极的直接电化学

Fig.7-1为修饰电极在0.1mol·L-1PBS(pH7.0)缓冲溶液中的循环伏安图，由图可见，Hb/nafion/GC(c)电极、Tm/Hb/nafion/GC(d)和Tm/CNTs/Hb/nafion/GC修饰电极(e)，均有一对良好的的氧化和还原峰。与Hb/nafion/GC电极相比Tm/Hb/nafion/GC电极明显加大了峰电流，氧化还原峰电位分别为-328mV和-357mV，峰电位差△E为29mV；由于稀土铥离子（Tm3+）的添加增强了氧化还原峰电流，峰电位差变小，修饰电极的可逆性增强。在实验的电位扫描范围内，GC电极（曲线a）上没有任何可观察到的电化学反应发生；修饰电极经多次循环扫描后，其伏安曲线几乎没有变化，这说明铥离子（Tm3+）和血红蛋白（Hb）在裸电极表面是很稳定的。Tm/Hb/nafion/GC修饰电极的氧化还原峰是可能是由于铥离子（Tm3+）作为电子传递介体的引入克服了血红蛋白（Hb）的氧化还原活性中心与电极表面的电子传递速率随两者间距离的增加衰减这一缺点，铥离子（Tm3+）起到了电子传递桥梁的作用。

2 Tm/Hb/nafion/GC修饰电极对过氧化氢的电催化作用

Fig.2为Tm/Hb/nafion/GC修饰电极在0.1 mol·L-1PBS（pH=7.0）缓冲溶液中注入微量H2O2后修饰电极的循环伏安图，当Tm/Hb/nafion/GC修饰电极在PBS缓冲溶液中注入H2O2后，Hb(Ⅲ)的还原峰电流大幅增加，而对应的Hb(Ⅱ)氧化峰电流减弱。表现出典型的电催化特征。在9.75×10-6 ~1.07×10-4mol·L-1范围内H2O2的还原峰电流与其浓度呈线性关系，线性回归方程：Ip(10-7A)= -0.34039 +0.45251C(10-5mol·L-1)，R=0.999，检测限为1.82×10-6mol·L-1。实验表稀土铥离子（Tm3+）的引入没有使血红蛋白失活，并加速了血红蛋白中的亚铁血红蛋白和高铁血红蛋白之间的转化，从而促进了血红蛋白与电极间的电子传递。

3结论

稀土铥离子（Tm3+）的引入明显的实现了血红蛋白修饰电极的直接电化学，并对浓度为9.75×10-6~1.07×10-4 mol·L-1范围内的H2O2有还原作用。

关键词：稀土铥 血红蛋白 修饰电极

Application of Thulium -Enzyme Modified Electrodes in Electrocatalysis

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Abstract: In this presentation, direct electrochemistry and electrocatalysis of hemoglobin modified on glassy carbon electrodes conbined with thulium ions was investigated. Nafion membrane was used for modified active material on electrode surface. Cyclic voltammogram of previous modified electrodes was carried out in 0.1mol·L^{-1}PBS (pH=7.0) solution. Electroreduction of

H_2O_2 at different concentration(1.95×10^{-6}~1.07×10^{-4} mol·L^{-1}) on Tm- Hb modified electrodes was determination by cyclic voltammogram and chronoamperometry .

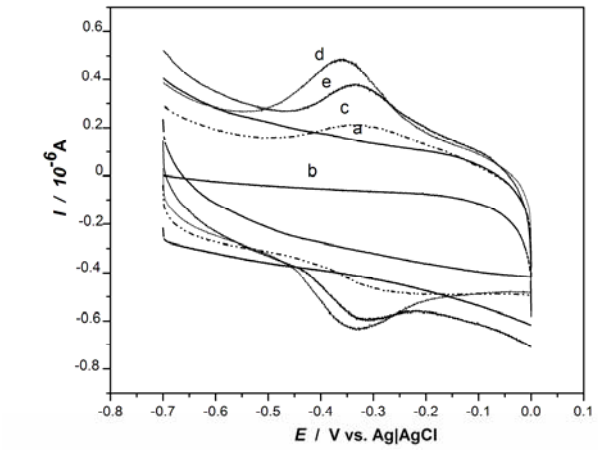


Fig.1 Cyclic voltammograms of Hb at (a) Gc, (b) Tm/nafion/GC, (c) Hb/nafion/GC, (d) Tm/Hb/nafion/GC, (e) Tm/CNT/Hb/nafion/Gc electrodes in 0.1M, pH 7.0 PBS with scan rate 0.2 V s^{-1}.

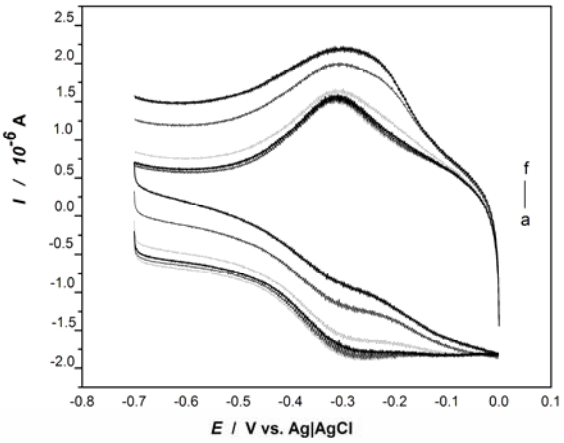


Fig.2 The CV of the modified electrode in the absence and the present of H_2O_2at different concentration, scan rate at 200 mV·s^{-1}.

亚微米级氧化铈制备工艺研究

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摘 要：本文以氯化铈溶液为原料，碳酸氢铵为沉淀剂，控制料液浓度、沉淀剂浓度、沉淀温度、沉淀时间等条件，采用共流均相沉淀法制备前驱体，在100℃烘干15h后于950℃下灼烧成功制备出了粒度分布集中，D50小于130nm、D90小于300nm的亚微米级CeO2粉体，并系统地研究了制备条件对亚微米级氧化铈粉体粒径大小的影响。
关键词：共流均相沉淀, 稀土，亚微米级氧化铈粉体

The making craft research of the sub-micron CeO_2 powder

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Abstract: In this text, the rare material is $CeCl_3$ solution and the precipitator is the carbonic acid. To control by the material of the rare of the consistency of, the consistency of the precipitator, the temperature of the precipitating, and the precipitating time, the homogenous of the writers use precipitation method and got the precursor shou, then drying 15 hours in 100 ℃ and burning the in be 950℃, Successfully, we finally get sub-micron powder which has the concentrated particle size, D_{50}<130 nm and D_{90}<350 nm. Besides writer make an intensive study about the condition how to influence the powders particle size.
Key words: homogenous precipitation method, rare earths, sub-micron powder CeO_2

混合沉淀法制备氧化钕工艺研究

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摘 要：用草酸沉淀氯化钕溶液生产氧化钕是较为传统的方法。近年来，有的企业为降低生产成本改用碳铵沉淀，但这种方法生产的氧化钕，其部分物理性能指标达不到用户的要求。本文通过对草酸沉淀法制备氧化钕工艺进行了深入研究，发现采用草酸与氨水混合沉淀剂沉淀氯化钕溶液制备氧化钕，得到产品性能与单一用草酸沉淀氯化钕溶液完全相同的氧化钕产品，同时使草酸单耗下降0.32Kg/Kg(氧化钕)，且氧化钕收率提高0.8%。每吨氧化钕成本降低3240元，具有显著的经济效益。

关键词：稀土，氧化钕，制备

Craft research of the mixture precipitates system to preparing oxidation neodymium

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Abstract: Using the oxalic acid as a precipitator to make oxidation neodymium is a traditional method .In recent years, the reduce the of the order to of the some corporations are in cost of production, they convert to the carbonic acid hydrogen An precipitator, and the properties cann't of the of physical of the some index of the result isn't reach the consumer's required. By means of making an intensive study of the technology about making oxidation neodymium, we find out the result which takes the oxalic acid or the mixture of oxalic acid and ammonia as a precipitator is almost identical. Meanwhile the unit cost of the oxalic acid could be dropped by 0.32kg/kg(Nd_2O_3), the cost of production could be dropped by 3240 yuan per kilogram, and the ratio will be risen by 0.8%, So it will have immeasurable economic benefits.

Key words: rare-earths, Nd_2O_3, make

稀土联动萃取分离工艺的设计与控制

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摘 要：液-液萃取在稀土分离工业中广泛应用, 多组份的分离往往需经过多道分离工序，分离消耗主要体现在循环萃取剂皂化所使用的碱(氨)及反萃所使用的酸上。 为了分离工艺衔接的需要，出现了稀土皂和稀土洗涤技术，使得皂化及反萃过程与稀土分离过程相对独立。在此基础上，产生了新的衔接工艺即稀土联动萃取分离工艺。

传统工艺中皂化-稀土负载-萃取-洗涤-反萃的过程里，负载稀土的萃取剂和稀土溶液仅经过一次分离交换，效率较低。通过稀土分离过程的优化调整, 使得负载稀土的萃取剂及含有稀土元素的水相料液实现多次分离交换，分离效率得到充分提高, 从而降低了稀土萃取分离全流程的消耗。本文对于联动萃取分离工艺的主要思想进行了简述。

萃取平衡和物料平衡是稀土萃取分离过程设计和控制的关键。 联动萃取分离工艺的萃取平衡关系与常规体系相似, 但物料平衡关系要更为复杂。本文从串级萃取理论出发, 由萃取平衡关系和物料平衡关系, 给出较简单的两组份体系的纯度梯度公式。对于多组份体系, 本文介绍了采用计算机仿真技术进行工艺设计的方法。本文还进一步探讨了稀土联动萃取分离工艺的实际控制, 并介绍了处于研究中的联动萃取控制参考软件的设计思路。

Process Design and Control of Hyper-linked Rare Earth Separation of Solvent Extraction

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Abstract: Liquid-liquid extraction is widely used in the rare earth (RE) separation industry, separation of multiple components often requires multiple separation steps, where the major separation consumption is the soda and acid consumed in the saponification and stripping of the extractant during the recycling process. Techniques like the “rare earth saponification” and “rare earth scrubbing” leaves the recycling process alone from the rare earth exchange. By optimizing the RE separation process to utilizing the RE loaded extractant and RE solution more efficiently, the so called Hyper-linked RE separation process could reduce the consumption of the separation process.

In the ordinary separation process, major operation includes extractant saponification, RE loading, extracting, scrubbing and stripping, where the RE loaded extractant and RE solution are being used for only once during each separation step, thus the efficiency is comparatively low. In the hyperlinked process, the RE loaded extractant and RE solution are being used for more than once, thus the efficiency is much higher and separation consumption is reduced. In this paper, the hyper-linked RE separation process is briefly introduced.

Extraction equilibrium and mass balance is the key of RE separation process design and

control. In the design and control of hyperlinked process, though the extraction equilibrium is similar to but the mass balance is much sophisticated from the ordinary process. In this paper, we start from the countercurrent extraction theory, by utilizing the extraction equilibrium and material balance, the equation of 2-component purity gradient was obtained. For system with multiple components, the design using computer simulation is also introduced. Further discussions on the control of hyperlinked process are also presented. A software constructing roadmap for control assistant of hyperlinked RE separation process control is also introduced.

Key words: Rare Earth Separation, Countercurrent Extraction

柠檬酸镧诱导 Hela 细胞失巢凋亡

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摘 要：有报道表明稀土元素镧能诱导肿瘤细胞的凋亡。我们首次观察到Hela细胞经一定浓度的柠檬酸镧(0.001~ 0.1 mM/L）处理48h后，发生了失巢凋亡。在柠檬酸镧处理细胞前，Hela细胞连续接受多次“失巢凋亡驯化”过程，以除去对失巢凋亡敏感的细胞。同时采用Annexin/PI、AO/EB染色、western blot检测PARP片段化以及软琼脂集落形成实验来证明柠檬酸镧诱导的失巢凋亡。线粒体膜电位的下降、caspase-9的激活以及Bax表达水平的下降表明线粒体介导的内源性凋亡信号途径参与了这一凋亡过程。另外，caspase-8也发生了激活，但是比caspase-9激活得晚。进一步的研究结果还表明，细胞骨架在caspase-9被激活后发生了瓦解重组，同时还伴随着线粒体与F-actin的共定位，揭示细胞骨架、线粒体也与柠檬酸镧诱导的Hela细胞失巢凋亡密切相关。

关键词：稀土，柠檬酸镧，凋亡，失巢凋亡，caspase, 细胞骨架，线粒体

LaCit induces anoikis of Hela cells

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Abstract: Some reports show that lanthanum, a rare earth element, was able to induce apoptosis in certain cancer cells. In the present paper, for the first time we report the observation of anoikis induced by Lanthanum citrate (LaCit) in Hela cells at a concentration of 0.001~ 0.1 mM/L after 48h-treatment. Before cell treatment, Hela cells were subjected to anoikis- resistant selection to avoid anoikis –sensitive cells in order to ensure specificity of LaCit -induced anoikis. Anoikis was determined by Annexin/PI, AO/EB staining, cleavage of PARP and soft agar assay. Further, decrease of mitochondrial membrane potential, the cleavage of caspase-9 and a dose-dependent increase expression of Bax were detected during the anoikis induced by LaCit, implied that intrinsic pathway was involved in the anoikis induced by LaCit. In addition, activation of caspase-8 was also detected, however it occurred later than that of caspase-9. Further studies revealed LaCit causes reorganization of actin cytoskeleton after cleavage of caspase-9, and accompanied by an increase in co-localization of F-actin with mitochondria, suggesting that actin cytoskeleton of mitochondria played an important role in anoikis induced by LaCit.

Key words: rare earth elements, lanthanum citrate, apoptosis, anoikis, caspase, actin cytoskeleton, mitochondria.

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超磁致伸缩 TbxDy1－xFe1.95 合金的磁致伸缩性能研究

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摘 要：本文研究了Tb/Dy比例改变对TbxDy1－xFe1.95（x=0.30、0.32、0.34和0.35）合金的矫顽力、自旋再取向温度以及变温和加压磁致伸缩系数λ等的影响。结果表明，随着x值的增大，TbxDy1－xFe1.95合金的矫顽力逐渐增大；合金的自旋再取向温度Tr逐渐降低，材料低温特性较好；而合金的磁致伸缩性能的变化则较为复杂：在-20℃～90℃范围内对四个成分的合金的磁致伸缩系数进行了研究，结果表明，TbxDy1－xFe1.95（x=0.30、0.32、0.34和0.35）合金的磁致伸缩系数均随温度的升高而降低，就合金的磁致伸缩温度系数而言，x=0.34时具有最小值。对合金在预加压应力分别为0MP和10MP条件下的磁致伸缩系数的研究表明，同样磁场条件下，加压10MP条件下合金的磁致伸缩系数较0MP时有显著的提高；在相同压应力情况下，Tb含量高的合金在低场下具有较好的跳跃效应，Tb含量低的合金在高场下具有较好的跳跃效应。

关键词：磁致伸缩，磁滞回线，自旋再取向，跳跃效应

Studies on magnetostrictive properties of $Tb_xDy_{1-x}Fe_{1.95}$ giant magnetostrictive alloy

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Abstract: In this paper, as Tb/Dy ratios changed, the coercive force、spin polarization temperature、magnetostrictive coefficient under variable temperature and pre-compressive stress conditions of TbxDy1－xFe1.95（x=0.30、0.32、0.34 and 0.35）were investigated. The results showed that, as x increase, the coercive force of TbxDy1－xFe1.95（x=0.30、0.32、0.34 and0.35）increased; While the spin polarization temperature Tr decreased, low temperature characteristics of the material is better. The magnetostrictive properties of the alloys changed complicatedly: The magnetostrictive coefficients of TbxDy1－xFe1.95（x=0.30、0.32、0.34 and 0.35）were studied between -20～90 ℃. The results showed that the magnetostrictive coefficients of the alloys decreased with the increases of temperature. The magnetostrictive temperature coefficient of the alloys is lowest when x=0.34. The studies on magnetostrictive coefficients of the alloys under pre - compressive stress of 0MP and 10MP showed that, under the same magnetic field, the magnetostrictive coefficients of the alloys under 10MP pre - compressive stress were enhanced significantly. With the same pre - compressive stress, the alloy with higher content of Tb performed better jump effect at lower magnetic field., while the alloy with lower content of Tb performed better jump effect at higher magnetic field.

Keywords: magnetostriction, magnetic hysteresis loop, spin polarization, jump effect

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制备方法对双钙钛矿 LaSrFeCoO6 催化剂甲烷燃烧催化活性的影响

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摘 要：采用溶胶-凝胶法和非晶态合金法制备了LaSrFeCoO6双钙钛矿化合物，使用XRD、FT-IR、H2-TPR和TEM等表征手段对比研究了制备方法对其甲烷燃烧活性的影响。XRD物相分析结果表明在空气气氛中1100℃焙烧3h后，采用非晶态合金法和溶胶-凝胶法制备的样品均形成单一双钙钛矿型物相LaSrFeCoO6；FT-IR结果表明非晶态前驱物有配位水和结晶水的存在，羧基c-o伸缩振动峰变成单重峰，说明配合物的羧基已经配位；H2-TPR分析结果表明，非晶态合金法制备的LaSrFeCoO6催化剂，活性氧中心数量多且活性中心的氧含量高；甲烷燃烧活性测试结果表明，非晶态合金法制备的样品甲烷燃烧催化活性最好T10、T90分别为387.2℃和592.7℃。TEM形貌分析结果表明，非晶态合金法制备的LaSrFeCoO6催化剂粒径较小、分散性好并且无明显烧结。实验结果表明，制备方法对LaSrFeCoO6双钙钛矿化合物的甲烷燃烧催化活性有较大影响。非晶态合金法制备的样品分散性和有序性好，表面氧富集，因此催化活性较好。

关键词：双钙钛矿；甲烷催化燃烧；溶胶-凝胶法；非晶态合金法

The Effect of Preparation Methods on Methane Combusion Catalytic Activity of Double Perovskites $LaSrFeCoO_6$

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Abstract: Double perovskites oxides $LaSrFeCoO_6$ have been investigated by XRD,FT-IR, H_2-TPR and TEM determination, which were preparaed by sol-gel method and amorphous alloy method. The XRD experiment results showed that the single-phase doule perovskite-type oxides $LaSrFeCoO_6$ were synthesized by the sol-gel method and amorphous alloy method after 1100℃ calcinations for 3h in air; FT-IR experiment reasults showed that there are some crystal water and coordinated water in it. And carboxylic c-o stretching vibration peak into single peak on the complex coordination argued the existence of carboxyl; H_2-TPR results showed that the $LaSrFeCoO_6$ catalyst prepared by the amorphous alloy method has more reactive oxygen species.Moreover the number of active center on $LaSrFeCoO_6$ catalyst is the highest of all the samples; Methane combustion test results showed that the sample perparaed by amorphous alloy method has a better catalytic activity, which the T_{10} and T_{90} were 387.2℃ and 592.7℃. And the results of TEM morphology analysis showed $LaSrFeCoO_6$ prepared by the amorphous alloy method has the smaller particle size, the better dispersion and none obvious sintering. All of the results indicated that the preparation method of double perovskite oxides $LaSrFeCoO_6$ has a greater impact on activity of methane combustion. The samples prepared by Amorphous alloy have better distribution and order of particle ,and oxygen enrichment on its surface. So it has the

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better catalytic activity.

Key words:double perovskite; catalytic combusion of methane;sol-gel; amorphous alloy

钆对宫颈癌细胞作用的蛋白质组学研究

李艳晖

摘 要：稀土化合物是否具有抗癌作用目前尚未定论。本文采用差异蛋白质组学方法研究钆对宫颈癌细胞（Hela）的作用，探讨钆抗癌机制。以Hela细胞为研究对象，用MTT 法分别观察不同浓度氯化钆和柠檬酸钆对细胞增殖的作用。用Hochest 33258染色法观察氯化钆和柠檬酸钆所诱导的Hela细胞凋亡。提取钆作用于Hela细胞后的总蛋白,进行双向电泳,凝胶考染显色,用ImageMaster 2D Platium 5.0软件对获得的蛋白图谱进行分析,与对照组相比较，寻找钆作用后差异表达的蛋白质。切取差异蛋白点,胶内酶切后进行MALDI-TOF-MS测定和数据库搜索,实现对蛋白点的鉴定。结果表明0.005 -1 mmol/L浓度范围内的氯化钆和柠檬酸钆与Hela细胞共同培养24 h后对Hela细胞增殖具有抑制作用，在1mmol/L浓度下趋于最大值。Hochest33258染色结果表明0.15 mmol/L氯化钆和0.07 mmol/L柠檬酸钆作用24 h后可显著抑制HeLa 细胞的生长（抑制率约30%），引起细胞缩小,核浓缩。经二维凝胶电泳结果显示：与对照组相比氯化钆处理组有15个蛋白质上调、18个蛋白质下调；柠檬酸钆处理组有14个蛋白质上调、22个蛋白质下调。差异蛋白的质谱鉴和蛋白质印迹验证工作正在进行。

关键词：氯化钆；柠檬酸钆；HeLa细胞; 蛋白质组学;

The Proteomics of Gadolinium to Hela cell

Li yanhui

Abstract: The question whether rare earth compounds have any effect on cancer remains unknown up to the present. Thus, proteomic experiments were performed in this paper to study the effect and mechanism of gadolinium on cervical cancer cell line Hela. MTT assay was used to detect the viability of cells exposed to gadolinium in the form of gadolinium chloride or gadolinium citrate at different concentrations. Cell apoptosis induced by gadolinium was observed by Hochest 33258 staining method. Total proteins were extracted from the exposed cells and applied onto two dimensional gel electrophoresis for protein separation. MALDI-TOF-MS was used to identify the differentially expressed proteins from gadolinium-treated cells and the control. Results showed that either gadolinium chloride or gadolinium citrate in the range of 0.005 -1 mmol/L could inhibit the proliferation of HeLa cells after treated for 24 h. Observation from Hochest 33258 staining indicated that 0.15 mmol/L gadolinium chloride or 0.07 mmol/L gadolinium citrate could significantly inhibit cell proliferation at an approximate inhibitory rate of 30%, resulting in the shrinkage of cells and nucleus. Results from two dimensional gel electrophoresis showed that 15 proteins were up-regulated while 18 were down-regulated, when the gadolinium chloride-treated group was compared with the control. For gadolinium citrate-treated group, 14 proteins were up-regulated while 22 were down-regulated. The differentially expressed proteins are currently being identified by MALDI-TOF-MS and verified via Western blotting.

Keywords:gadolinium; HeLa cells ; proteomics ;

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La2BTiO6（B=Mn、Fe）催化剂的制备及其对苯酚光催化降解性能的研究

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摘 要：大多数煤化工生产中，会产生大量含酚废水，高浓度的含酚废水可回收利用，对于低浓度含酚废水，还未找到一种理想的处理方法。常规的物理、化学和生物方法处理工业废水，难以满足净化处理技术和经济上的要求，因此，废水的处理技术研究得到人们的广泛关注。迄今为止，将双钙钛矿型复合氧化物应用于光催化的研究甚少[1]，将其应用于苯酚光催化降解反应的还未见报道。

本文采用溶胶-凝胶法，以葡萄糖做络合剂在静态空气气氛中 700℃焙烧 3h 合成了La2BTiO6（B=Mn、Fe）两种钛系催化剂，用 X 射线衍射（XRD）、程序升温还原测定（H2-TPR）、比表面积测定（BET）、傅立叶变换红外光谱测试（FT-IR）、空气中不同温度下电导测定等方法来表征样品的物相和表面特征。以苯酚光催化降解反应为探针进行催化剂活性评价。由 XRD 实验结果发现，两种钛系催化剂经 700℃焙烧 3h 后分别呈现出单一的 La2MnTiO6 和 La2FeTiO6 双钙钛矿型氧化物物相。通过研究两种催化剂对苯酚在紫外光下的催化降解曲线发现，在 La2FeTiO6 催化剂催化作用下，光照 3h 后苯酚的降解率为 52.7%，而在 La2MnTiO6 催化剂催化作用下，光照 3h 后苯酚的降解率为 19.9%。由此可以看出，La2FeTiO6 催化剂对苯酚降解反应的催化效果比 La2MnTiO6 要好的多。

关键词：双钙钛矿，光催化作用，苯酚，溶胶-凝胶法，葡萄糖

Preparation of La2BTiO6(B=Mn、Fe)catalysts and their photocatalytic activities in Phenol Degradation

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Abstract: In most of the coal chemical production, a large amount of waste water containing phenol was produced. Waste water containing high concentration of phenol could be recycled. However, an ideal treatment method has been not yet found for wastewater containing low concentration of phenol. The conventional physical, chemical and biological methods treating industrial waste water were difficult to deal with clean technologies and meet with the financial requirements. Therefore, the waste water treatment technology researches require people's attention. So far, double-perovskite oxide compound was used rarely in the study of photocatalytic.

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Phenol being used in its photocatalytic degradation has not been reported.

Two kind of La_2BTiO_6（B=Mn、Fe）perovskite catalysts were prepared using the sol-gel method, glucose monohydrate being used as complex agent , and roasting 3 hours at 700℃in static air. The catalysts were characterized by means of X-ray powder diffraction（XRD）, Temperature programmed reduction (H_2-TPR), Surface area (BET), Fourier transform infrared spectroscopy (FT-IR),and Electrical Conductivity Test. Photocatalytic degradation reaction of phenol as a probe, the samples' photocatalytic activities could be evaluated. XRD analysis results showed that the two catalysts formed single-phase double perovskite La_2MnTiO_6 and La_2FeTiO_6 respectively. The photocatalytic degradation curves of phenol over the two catalysts in the ultra-violet light were identified. It was shown that photodegradation rate was 52.7% after being lighted 3h in the function of compound La_2FeTiO_6 , while the other rate was 19.9% by using La_2MnTiO_6 catalyst and during the same light time. Thus it can be seen, the catalytic effect of the compound La_2FeTiO_6 was much better than La_2MnTiO_6 catalyst for the degradation reaction of phenol.

Keywords: double perovskite; photocatalytic degradation; Phenol; sol-gel method; glucose

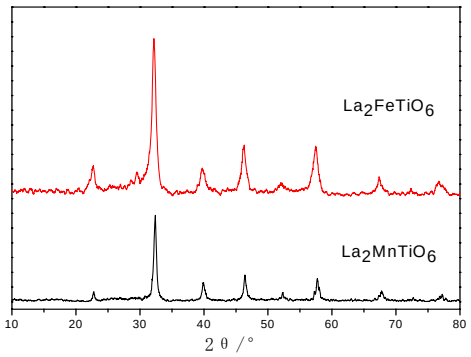


图1 700℃下焙烧制得两种催化剂的XRD图谱

Fig1 X-ray diffraction spectrum of three catalysts after culminations700℃ for 3h in air

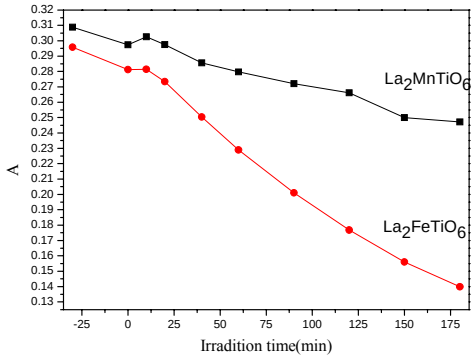


图2 两种催化剂对苯酚的光催化降解

Fig1 Effect of different catalysts on photodegradation rate under UV light irradiation

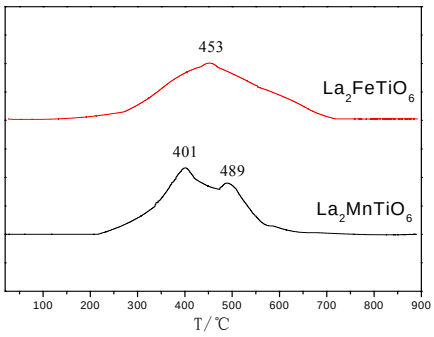


图3 La_2BTiO_6(B=MnFe)催化剂700℃下焙烧3h的H_2-TPR图谱

Fig.3 H_2-TPR patterns of La_2BTiO_6 (B=MnFe)catalysts after calcinations at 700℃ for 3h

有机稀土铽配合物在微腔中的电致发光特性

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摘 要：自从1987年双层有机电致发光器件（OLED）实现以来，OLED因其亮度高、效率高和成本低等众多优点成为当前显示领域研究的热点。普通的有机发光材料半峰全宽约100 nm，影响了器件的色纯度，不利于全色显示。而窄线宽发射的有机稀土配合物即可利用配体的激发三重态能量，又可利用激发单重态能量，其理论发光效率高达100％，是OLED中的理想发光材料。然而，有机稀土配合物的发光来自稀土离子的特征发射，通常具有多个发光峰。为了进一步提高OLED的色纯度和电致发光性能，我们在有机稀土配合物的OLED中引入微腔结构。发光层材料采用的是Tb(AcA)3phen，OLED结构为玻璃衬底/ITO/WO3/TCTA/Tb(AcA)3phen/TPBI/LiF/Al. 微腔OLED结构为玻璃衬底/反射镜/ITO/WO3/TCTA/Tb(AcA)3phen/TPBI/LiF/Al. Tb3+离子的四个发光峰位于490nm，546nm,584nm和620nm。OLED中的主峰为546nm。而微腔OLED的主峰受到腔长的控制，Tb3+离子的每个发光峰均可以成为主峰，同时器件的亮度等性能明显改善。

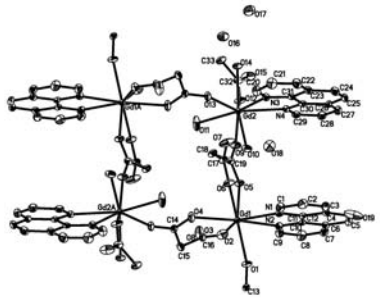
Electroluminescent properties of a terbium (III) complex in microcavity

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Abstract： Since double-layer organic electroluminescent devices (OLEDs) were realized in 1987, OLEDs have been intensively studied in display due to high luminescent, high efficiency and low cost. Normal organic materials have a typical half width of about 100nm which is not suitable for full color flat panel displays. Organic lanthanide complexes with sharp emission bands are ideal emitters in OLED due to a potential 100% inner quantum efficiency since both singlet and triplet excitons can transfer energy to the luminescent lanthanide ions. Generally, such complexes exhibit multi peaks from lanthanide ions. In this study, microcavity is introduced into OLED based on lanthanide complex to improve the color purity and other EL properties. Tb(AcA)3phen was used as emitter. The OLED has a structure of glass/ITO/WO3/TCTA/Tb(AcA)3phen/TPBI/LiF/Al. Microcavity OLED has a structure of glass/mirror/ITO/WO3/TCTA/Tb(AcA)3phen/TPBI/LiF/Al. Tb3+ ion shows four emission peaks at 490nm,546nm,584nm,and 620nm。The main peak in the OLED is at 544nm. While in the microcavity OLEDs, EL properties can be improved greatly, and each peak can be main peak due to the control of microcavity.

丙二酸桥联钆（III）配位聚合物{[Gd2 (Phen)2 (Mal)2・3H2O]・4H2O}n 的合成、结构与磁性

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摘 要：合成了一种新型丙二酸桥联钆（III）配位聚合物{[Gd2 (Phen) 2 (Mal)2·3H2O]·4H2O}n (Phen = 1,10-phenanthroline; Mal = malonate dianion)，并进行了X-射线单晶衍射结构分析。这种配合物由中性双核单元[Gd2 (Phen) 2 (Mal) 2]组成，以丙二酸根作为“积木”连接相邻的金属钆（III）中心形成一维方格网配位聚合链。金属钆（III）离子有由Gd-1, 10-phenanthroline层组成的两种不同的配位环境，并由丙二酸根连接堆积而成配位聚合物。该配合物通过三齿丙二酸根离子展现了弱而有意义的反磁相互作用。

Sch.1. Crystal structure of tittle compound.

关键词：钆配合物；丙二酸；配位聚合物；晶体结构；磁性。

Synthesis, structure, and magnetic properties of a novel one-dimensional malonato-bridged gadolinium (III) complex {[Gd_2 $(Phen)_2$ $(Mal)_2$·$3H_2O$]·$4H_2O$}$_n$

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Abstract:A novel malonate-bridged gadolinium(III) complex of formula {[Gd_2 $(Phen)_2$ $(Mal)_2$·$3H_2O$]·$4H_2O$}n (Phen = 1,10-phenanthroline; Mal = malonate dianion) has been prepared and structurally characterized by X-ray crystallography. are used. This complex, which consists of neutral binuclear units [Gd_2 $(Phen)_2$ $(Mal)_2$] and employs malonate groups as building blocks to link adjacent metal centers forming a one-dimensional square grid coordination polymeric chain. The gadolinium (III) ions have two different coordination environments being composed of two different Gd-1,10-phenanthroline layers which are pillared by malonate bridge ligands. The complexe exhibit weak but significant antiferromagnetic interactions across the tridentate malonate dianion account for the overall antiferromagnetic behavior observed.

铥镱镥双进料三出口萃取分离工艺仿真研究

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摘 要：针对铥镱镥富集物的原料组成特点及传统萃取分离工艺中存在的问题，对同时可得到三个高纯产品的铥镱镥双进料三出口萃取分离新工艺进行了计算机仿真，输出了各稀土元素在两相中的槽体分布平衡曲线，探索了双进料三出口萃取分离工艺中各元素在槽体各级的分布规律。通过经济指标比较，结果表明，与传统工艺相比，该工艺可使酸碱化学试剂消耗降低30%以上。

关键词：双进料三出口； 串级萃取；仿真；铥镱镥富集物

Study on two-feeding and three-outlet extraction separation process of the enriched oxides of Thulium, Ytterbium and Lutecium by computer simulation

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Abstract: In view of the characteristics of the material composition of the enriched oxides of thulium, ytterbium and lutecium and some problems in it's traditional extraction separation process, the computer simulation of a novel two-feeding and three-outlet extraction separation process on the material was developed, in the process three products in high purity(>99.99%) would be obtained at one time, the distributing curves of every element in both organic and aqueous phases in the cascade were output, and the distribution rules of rare earth elements in every stage of two-feeding and three-outlet extraction process were explored. The economical and technical index computation results show the consumption of the acid and base chemical reagents of the novel process would be saved more than 30%.

Keywords: two-feeding and three-outlet; countercurrent extraction; simulation; the enriched oxides of thulium, ytterbium and lutecium

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柠檬酸镧作用于人肺腺癌细胞 A549 的差异蛋白质组学研究

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摘 要：本文采用差异蛋白质组学方法研究了柠檬酸镧（Lacit）对人肺腺癌细胞（A549）的作用，探讨它的抗癌机制。首先用MTT 法分别观察不同浓度和时间Lacit对细胞增殖的抑制作用。然后用Hochest 33258染色法观察一定浓度的Lacit所诱导的A549细胞凋亡。提取经Lacit作用后A549细胞的总蛋白,进行双向电泳,凝胶考染显色,用ImageMaster 2D Platium 5.0软件对获得的蛋白图谱进行分析,与对照组(不加Lacit)相比较，寻找柠檬酸镧作用后差异表达的蛋白质。切取差异点,胶内酶切后进行MALDI-TOF-MS分析和数据库搜索,实现对蛋白点的鉴定。

关键词：柠檬酸镧，肺腺癌A549细胞，凋亡，双向凝胶电泳 ，差异蛋白质组学

The differential Proteomic research of human Lung Adenocarcinoma cell A549 which treated with Lacit

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Abstract: In order to know the mechanisms of the effect of Lacit to the lung-cancer, we research it by proteomic experiments. A549 cell growth inhibition of Lacit in different concentrations and time were analyzed by MTT assay. Hoechst 33258 has been used to verify that Lacit could induce cell apoptosis .The total protein of the Hela cells after treated by Lacit were extracted. Then 2D and MALDI-TOF-MS were used to identify the different proteins.

Key words: Lacit , Lung Adenocarcinoma cell A549, apoptosis, 2-D gel electorphoresis, differential Proteome

稀土微合金元素对 U71Mn、RE Ⅱ重轨钢动态再结晶的影响

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（内蒙古科技大学材料与冶金学院）

摘 要：采用Gleeble-1500D热模拟实验机进行模拟实验。通过比较在不同变形条件下得到的真应力-真应变曲线，研究变形条件对U71Mn、RE Ⅱ动态再结晶的影响；通过比较相同变形条件下三种重轨钢的真应力-真应变曲线及其RTT曲线，研究微合金元素对重轨钢动态再结晶的影响。

实验结果表明：变形温度越高，变形速率越低，动态再结晶越容易发生；由于微合金元素RE的作用，使RE Ⅱ的动态再结晶开始时间延长，变形奥氏体的动态再结晶的名义激活能提高，对奥氏体的动态再结晶起到抑制作用。

The effect of microalloying elements on Dynamic recrystallization of U71Mn、RE Ⅱ heavy rail steels

Abstract: This dissertation investigates the heavy rail steel. The compression deformation tests have been carried out by using Gleeble-1500D thermal simulation machine. This paper analyzes the effect of deformation conditions on dynamic recrystallization of U71Mn, RE Ⅱ steels by comparing true stress-true strain curves under different deformation conditions.This paper also studies the effect of microalloy elements on heavy rail steels by comparing true stress-true strain curves and the RTT curves of three kinds of heavy rail steels which under the same deformation condition.

The experimental results show that dynamic recrystallization occurs more easily under the condition of higher deformation temperature and lower deformation rate .Because the effect of RE, the starting time of dynamic recrystallization of RE Ⅱ has been put off , activation energy of dynamic recrystallization has been increased and the dynamic recrystallization of austenitic has been controlled.

Keywords: heavy rail steel; microalloy elements; dynamic recrystallization; mathematical model

柠檬酸镧诱导肿瘤细胞凋亡的研究

沈立明 1.2.3*，兰子尧 3，张文昌 2，任晓虎 2，郑梓铎 2

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摘 要：采用噻唑蓝（MTT）法检测稀土化合物柠檬酸镧在1×10-3~5mmol·L-1浓度范围内对体外培养的人乳腺癌细胞株MCF-7、前列腺癌细胞株PC-3、肝癌细胞株HepG2和宫颈癌细胞株Hela生长的影响。结果表明，柠檬酸镧对各种癌细胞生长的影响存在浓度依赖性，低浓度无明显作用特征，高浓度抑制癌细胞生长；不同肿瘤细胞对稀土的响应不同, Hela细胞相对敏感，其IC50值为0.27 mmol·L-1，而MCF-7细胞为0.3mmol·L-1, PC-3细胞为0.8mmol·L-1,HepG2细胞为3.13 mmol·L-1。进一步以0.15 mmol·L-1的柠檬酸镧作用于Hela细胞，采用Hoechst 33258荧光染色、PI单染流式细胞仪检测、Annexin V-FITC/PI双染色法观察镧对Hela细胞的毒性作用。结果表明，柠檬酸镧作用24h后，Hela细胞出现明显的凋亡特征，PI染色流式细胞仪检测可见凋亡峰，细胞周期分析表明sub-G1期细胞显著增加、G0/G1期细胞显著减少（P<0.05）,Annexin V-FITC/PI双染检测细胞凋亡率为85.75±5.72%（P<0.05）。上述结果表明柠檬酸镧能诱导癌细胞发生凋亡。目前正在用差异蛋白组学方法对稀土促进Hela细胞凋亡的机制进行研究。

关键词：柠檬酸镧；肿瘤细胞；增殖；凋亡

Apoptosis of Cancer Cells induced by Lanthanum Citrate

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Abstract: Effects of lanthanum citrate (LaCit) on the growth and viability of different cancer cell lines were investigated using MTT assay. Those included human breast cancer cell line MCF-7, prostate cancer cell line PC-3, hepatocellular carcinoma cell line HepG2 and cervix epitheloid carcinoma cell line Hela. Effects of LaCit on cancer cells were investigated at a concentration range of 1×10^{-3}~5 mmol·L^{-1}.Results showed a dose-dependent effect of LaCit on the growth and viability of different cancer cell lines. LaCit inhibited the growth of different cancer cell lines at higher concentrations, but non significant inhibition were observed at lower concentration. It was also found that the effect of LaCit on cell growth depended on cancer type. The most potent cytotoxicity of LaCit was observed in HeLa cells. The IC_{50} value for LaCit on Hela cells was 0.27

mmol·L^{-1}, while the IC50 values of LaCit on MCF-7, PC-3 and HepG2 were 0.3 mmol·L^{-1}, 0.8 mmol·L^{-1} and 3.13 mmol·L^{-1}, respectively. Methods of Hoechst 33258, PI and Annexin V-FITC/PI staining were used to further elucidate the cytotoxic mechanism of LaCit. After treatment with 0.15 mmol·L^{-1} LaCit for 24 h, typical morphological changes associated with apoptosis were detected, and apoptotic peaks in the cell cycle analysis were measured by flow cytometry. Sub-G1 phase were significantly increased and G_0/G_1 cell cycle arrest was observed in the LaCit-treated cells (P<0.05).The apoptosis rate obtained by Annexin V-FITC/PI double stain was 85.75±5.72% (P<0.05).Those results show that the inhibition of LaCit on Hela cells is related to the induction of cell apoptosis. The mechanism of LaCit-induced apoptosis in HeLa cells is currently under study by comparative proteomic approach.

Key words：lanthanum citrate；cancer cell；proliferation；apoptosis

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Ce3+掺杂 YAG 透明陶瓷的制备与光性能研究

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摘 要：Ce3+掺杂的YAG（Y3Al5O12）具有衰减时间短（～65ns），550nm处发射荧光与硅光电二极管的探测灵敏区匹配良好的优点，可作为闪烁材料，应用于中低能量射线（α, β粒子等）的探测。本文采用高纯微米级商业原料（≥99.99％），Al2O3，Y2O3，CeO2，固相反应法，在1750°C真空烧结10小时，制备了0.3at % Ce3+:YAG透明陶瓷，双面抛光后，厚度1.2mm的试样在可见光区500nm--900nm的直线透过率可达75％，光学均匀性良好。荧光光谱和X射线激发发射谱分析表明，发射峰位于500nm-700nm之间，为Ce3+的特征发射。

关键词：固相反应法；真空烧结；Ce:YAG；闪烁透明陶瓷；

Fabrication and luminescence study of Ce^{3+} doped YAG transparent ceramics

Abstract:Ce^{3+} doped YAG ($Y_3Al_5O_{12}$) have fast decay time(~ 65 nm), and its emitting light 550nm matches well with the silicon photodiode, it can be used in middle-low energy ray (γ ray and α partical) dectecting as scintillator materials. The present paper reports a fabrication of 0.3at％Ce:YAG transparent using high pure commercial powders, Al_2O_3, Y_2O_3, CeO_2, through solid state reaction method and vacuum scintering in 1750°C for 10 hours, the linear transmission in visible range 500nm--900nm reaches to 75% homogeneously (1.2 mm thick, double polished). Luminescence property were studied, the emitting wavelength lies in 500nm--700nm, indicating a characteristic Ce^{3+} emitting.

氟碳铈矿清洁生产过程中钍的回收

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摘 要：四川氟碳铈矿是我国第二大稀土矿，其中含钍 0.2%左右，目前工业生产采用氧化焙烧－盐酸浸出工艺，铈的纯度低，氟、钍等分散于渣和废水中，存在环境污染和资源浪费问题。氧化焙烧－稀硫酸浸出－萃取法是较好的清洁生产工艺, 能得到较高纯度的铈, 钍、氟进入溶液可回收利用, 工艺连续。硫酸稀土浸出液直接采用磷类萃取剂萃取，氟、钍、铈被萃入有机相，经过洗氟和还原反萃铈后，钍富集在有机相中，再经过反萃回收。本文主要研究了从磷类萃取剂 P507、P204、Cyanex 923 及其混合体系中反萃钍的性能，表明 P507 对于钍的反萃性能较好，在所研究的实验条件下，钍的单级反萃率可达 70%以上。同时还对反钍液的富集与提纯进行了研究，为氟碳铈矿清洁生产工艺的开发提供基础数据。

关键词：钍；反萃；回收；P507；P204；氟碳铈矿；

Recycling of thorium in the green process of bastnaesite

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Abstract: Sichuan bastnaesite is Chinese second largest rare earth ore, containing about 0.2% thorium in the concentrate. The present treatment process of Sichuan bastnaesite in the industry is oxidating roasting-hydrochloric leaching process. The problem of this method is that the purity of the cerium produced is low, and fluorine, thorium are dispersed into residue and wastewater, which causes pollution and resource waste. It's considered to be a promising green process to treat bastnaesite using oxidating roasting-sulphuric acid leaching-extraction process, because it can produce high purity cerium, and thorium, fluorine can be effectively recycled because they are dissolved into solution. Besides it's a continuous operation. During this process, the leached solution is directly extracted using phosphonic extractants, and cerium, thorium and fluorine are extracted into organic phase. Then the organic phase is washed to remove and recycle fluorine and reductive stripped to recycle cerium. After that thorium is enriched into the organic phase, then needed to be stripped to recycle and purify. This paper mainly studied to strip thorium from phosphonic extractant as HEHEHP, D2EHPA, TRPO and their mixture extraction system. The results indicated that the performance of stripping thorium from HEHEHP is better than from other phosphonic extractants. Under the studied condition, 70% thorium was stripped at most by single stage stripping. It was also studied to enrich and purify thorium from the stripping solution, to provide fundamental data to develop green treatment process of bastnaesite.

Keywords; thorium; stripping; recycle; HEHEHP; D2EHPA; bastnaesite

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从包钢尾矿坝总尾矿中回收稀土的研究

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摘　要：白云鄂博矿是一个富含稀土、铁的大矿床，有60%以上的尾矿堆存到尾矿坝，浪费资源，即使能二次利用但又要很大成本，而且长期堆存，给周围环境也带来长期的影响。综合利用工艺是一个无尾矿排放选矿工艺，是完全的循环经济和清洁生产工艺。不仅从根本上改变稀土冶炼企业的长期难以解决的三废污染问题，无尾矿排放从根本上解决了尾矿坝的压力，可以解决尾矿坝堆存的大量尾矿的回收利用。
关键词：尾矿坝；白云鄂博矿；稀土；选矿工艺

Recovery of Rare Earth Minerals from the Tailings Dam of Baogang

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Abstract: Baiyunebo mine is a large deposit of the rare-earth minerals and iron. More than 60% of the tailings is being stored up on the tailings dam, and a waste of resources. even if the use of the second but also costs a lot, and the long-term storage, to Environment is not a long-term. Technology is a comprehensive utilization of tailings emission-free dressing process is complete cycle of the economy and clean production technology. Not only fundamentally changed the rare-earth smelting enterprises are difficult to resolve the long-term waste pollution, the tailings discharge without a fundamental solution to the tailings dam pressure can be cleared from the tailings dam to solve a lot of recycling of tailings.
Key words: the tailings dam; Baiyunebo mine; RE minerals; concentrate technology

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用乳状液膜法提取白云鄂博矿床中钪

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摘 要：白云鄂博矿是一个富含钪的大矿床。高纯氧化钪是用在宇航、电子、超导和核工业的重要材料；乳状液膜是一种模拟生物细胞富集功能的新兴的高效节能型高技术快速分离方法，它综合了固体膜分离法和溶剂萃取法的特点，富集比高。本文根据白云鄂博矿床中钪的特性，提取原料钪含量相对较低，采用 P507 为载体的煤油-Span80-P507 -HCl 组成的液膜体系，研究了水中提取钪的基本原理，考查了制乳条件、油内比、水乳比、pH 值和提取时间等因数的影响。对含 Sc3+为 20m g / L 的稀选尾矿浸出液，采用制乳条件为：P507 12%，Span-80 3%，液体石蜡 1%，磺化煤油 84%；内水相 4mol/LHCl；油内比 1：1；水乳比 10：1，提取时间 15min，依次进行钪的提取试验，可获得提取率达 98%左右。
关键词：乳状液膜；白云鄂博矿；钪；提取

Extracting Sc3+ Using Liquid Membrane Emulsion Technology

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Abstract: Baiyunebo mine is a large deposit of the scandium-rich. The high-purity scandium oxide is used in the aerospace, electronics, nuclear industry and the super-important materials; emulsion liquid membrane is a kind of Enrichment simulated biological cell function in the emerging high-performance energy-saving Rapid high-tech methods, which combines solid membrane separation and solvent extraction of the characteristics and the high Enrichment ratio. According to the Baiyunebo deposit in the characteristics of scandium, scandium content of raw materials by extraction is relatively low, using P_{507} as the carrier of the kerosene-Span80-P_{507}-HCl composition of the membrane system to study the water extract of the basic principles of scandium, the conditions of making emulsion and the technological factors such as the ratios of oil to inner and water to emulsion, the pH and the extraction time etc. were investigated. Sc^{3+} for containing 20mg / L of the dip solution from the tailings of RE, emulsion conditions for the use of the system: P_{507} 12%, Span-80 3%, liquid paraffin 1%, 84% sulfonated kerosene; inner Water phase 4mol/LHCl; the ratios of oil to inner 1:1; water to emulsion 10:1, the extraction time 15min, in order to carry out the extraction of scandium testing, access to extraction rate of 98% or so.
Key words: liquid membrane emulsion technology; Baiyunebo mine; extraction
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制备条件对 La1-xSrxCoO3 (0≤x≤0.5) 体系电阻率的影响

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摘 要：用不同的烧结条件制备了钙钛矿氧化物 La1-xSrxCoO3 (0≤x≤0.5)系列样品，通过粉末 X 射线衍射分析确定了晶体的结构，由 Rietveld 方法拟合得到晶格参数随 Sr 掺杂量的变化。在 80K-300K 温度范围的直流电阻率测量表明，材料的电性质在 x=0.2 到 0.3 之间展示了从半导体到金属的相变(I-M)，半导体样品的电阻率随烧结温度、烧结时间的变化趋势与金属性样品相反，并对结构与电阻率的关系进行了讨论。

The influence of preparation condition on resistivity of $La_{1-x}Sr_xCoO_3$ (0≤x≤0.5) System

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Abstract： The perovskite oxide $La_{1-x}Sr_xCoO_3$ (0≤x≤0.5) series were prepared under different sintering conditions. Crystal structure was determined by powder X-ray Diffraction and lattice parameters as a function of Sr-concentration x were obtained by using Rietveld method. The dc resistivity investigated in the temperature range of 80-300K indicates that, the electric properties exhibit a metallic - insulator (M-I) transition for 0.2<x<0.3. The change of the resistivity of semiconductor-like sample with sintering temperature and sintering period is just opposite to that of metallic sample. The relationship between the structure and resistivity is discussed.

Keywords: Perovskites; Curie temperature; lattice parameter; resistivity; rare earths

Hydrothermal synthesis, crystal structure, and luminescence of lanthanide(III) coordination polymers with tetrafluorosuccinate and 1,10-phenanthroline

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Abstract: Luminescent lanthanide complexes have attracted attention for many years due to their potential applications in fluorescence materials, electroluminescent devices, bioassays, and luminescent probes. Lanthanide coordination polymers constructed by multicarboxylate ligands have recently attracted extensive interests, owing to their fascinating structure and potential applications in magnetism. The new coordination polymers $\{[Ln(TFSA)(phen)(H_2O)_4]\cdot 0.5(TFSA)\cdot 2(phen)\ H_2O\}_n$ (Ln = Sm, **1** and Dy, **2**; TFSA = tetrafluorosuccinate; phen = 1,10-phenanthroline) were synthesized and characterized using x-ray structure analyses, luminescence spectroscopy, and thermogravimetric analyses.

The crystal structure of the complex **1** is given in Figure 1. The Sm1(III) ion is eight - coordinated by two oxygen atoms from two TFSA ligands, two nitrogen atoms from phen molecule, and the other from four water molecules. The Sm1-O(carboxylate) bond distances are 2.322(3) and 2.378(3) Å, respectively, with the average bond distance of 2.35 Å. The Sm1-O (water) bond distances vary in the range of 2.373(3) ~ 2.473(2) Å with the average bond distance of 2.472 Å. The Sm1-N bond distances are 2.600(3) and 2.608(3) Å, respectively, with the average bond distance of 2.604 Å.

Adjacent Sm(III) ions are connected through single TFSA ligand to form a 1 – D coordination polymer chain. Both carboxyl groups of each TFSA ligand coordinate the Sm(III) ion in the rare monodentate fashion and thereby TFSA ligand acts as a μ_2 – bridging ligand. Namely, 1 – D chain was formed through the infinite extension Sm-$OOCCF_2CF_2COO$-Sm.

The structural characteristics of complex **2** are similar to that of complex **1**. The average distances of Dy1-O(carboxylate), Dy1-O(water), Dy1-N are 2.308, 2.371, and 2.553 Å, respectively.

The emission spectrum of **1** upon excitation wavelength of 345 nm shows three emission bands at 561, 595, and 642 nm, which are attributed to $^4G_{5/2} \rightarrow {}^6H_{5/2}$, $^4G_{5/2} \rightarrow {}^6H_{7/2}$, and $^4G_{5/2} \rightarrow {}^6H_{9/2}$ transitions of Sm(III) ion, respectively. The emission spectrum of **2** upon excitation at 309nm shows two emission bands at 482 and 571 nm, which correspond to the characteristic

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emission $^4F_{9/2} \rightarrow {}^6H_{15/2}$ and $^4F_{9/2} \rightarrow {}^6H_{13/2}$ transitions of Dy(III) ion, respectively.

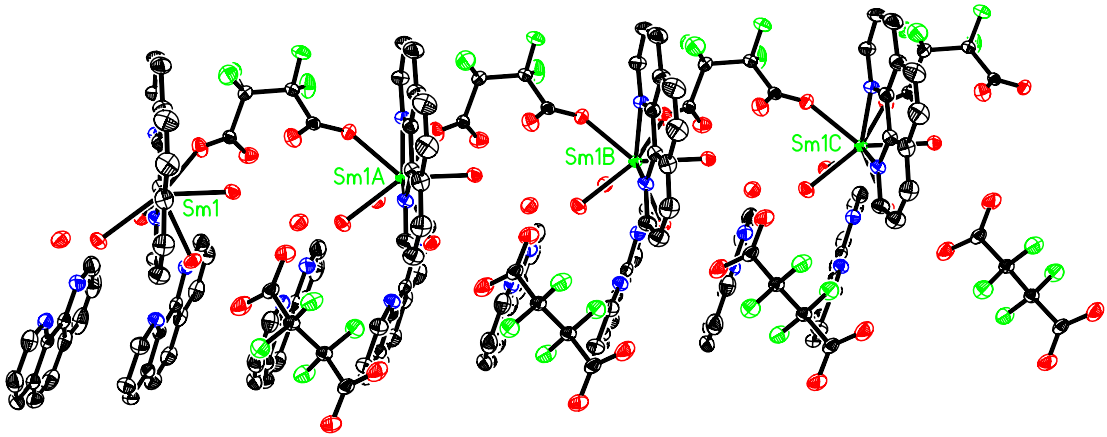


Figure 1　1 – D chain structure of complex **1**

近紫外 LED 用稀土有机配合物的合成与发光研究

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摘　要：本文设计并合成了一种含杂环结构的 β-二酮(β)，以 β和有机氮螯合配体 L 与 $EuCl_3$ 反应，合成了相应的 Eu(III)三元配合物 Eu β_3L，并用 ^{1}H-NMR、MS、元素分析、热重分析、红外吸收光谱、紫外－可见吸收光谱、荧光光谱等方法表征。热重分析表明该配合物热分解温度为 344 ^{o}C。配合物粉末的荧光激发光谱在 230 – 430 nm 呈现宽而强的激发带；在~395nm 近紫外光激发下，配合物发出强的橙红色荧光（图 1），归因于中心 Eu^{3+}离子的 $^5D_0$ - ^7F_J跃迁，未发现配体自身的荧光，表明有机配体吸收的激发光能量已有效地传递给中心 Eu^{3+}离子。实验结果说明：该 Eu(Ⅲ)三元配合物为优良的高热稳定性的光致发光材料，适合被 InGaN 近紫外光芯片激发。将所合成的 Eu(III)三元配合物荧光粉涂覆在发射~395nm 近紫外光的 InGaN 芯片上，制作了发光二极管，在 20 mA 正向电流激发下测定其发光光谱（图 2）和色坐标。制成的二极管发出强的 Eu^{3+}的特征橙红光，能较完全吸收 InGaN 芯片所发出的 395 nm 附近的近紫外光，器件的色坐标为(x = 0.66 , y = 0.33)，表明该配合物可应用于 LED 全色显示和白光 LED 中。

关键词：β-二酮，Eu(Ⅲ)有机三元配合物，荧光，发光二极管

Study on synthesis and photoluminescence of a europium(III) organic ternary complex and its application in fabrication of NUV-based LED

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Abstract：A β-diketone and its europium(III) ternary complex, Eu β_3L, were designed and synthesized, where L is a nitrogen-donor chelate ligand. The composition and structure of the synthesized β-diketone ligand and Eu(III) complex were confirmed by ^{1}H NMR , mass spectroscopy and elementary analysis. The Eu(III) complex was also characterized by IR , UV-visible , photoluminescence (PL) measurement and TG-DTG analysis. TG-DTG result shows that the Eu(III) ternary complex exhibits highly thermal stability with a decomposition temperature of 344 ^{o}C. The excitation spectrum of the complex powder shows a wide and strong excitation band between 230 – 430 nm when monitored at 612 nm. Excited by ~395 nm near UV-light, the complex emits strong red-orange light due to $f-f$ transitions of the central Eu^{3+} ion, and no emission from the ligands is found (Fig.1), indicating that the energy of the excitation light absorbed by the ligands has been efficiently transferred to the central Eu^{3+} ion, and this complex is

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an excellent photoluminescent material suitable to be excited by a near UV-emitting InGaN chip. Light-emitting diodes (LEDs) were fabricated by coating the complex onto ~ 395 nm-emitting InGaN chips. The emission spectrum of the fabricated LED under 20 mA forward bias shows the characteristic red-orange emissions from the Eu^{3+} ion in the complex (Fig.2). Bright red-orange light emitted from the lighting LED can be observed by naked eyes (Fig.2, insert). The CIE chromaticity coordinates of the LED are (x = 0.66 , y = 0.33). The results show that the europium(III) ternary complex is a potential phosphor for fabrication of NUV-based white LEDs.

Keywords：β- diketone, europium , ternary complex , photoluminescence , light-emitting diodes

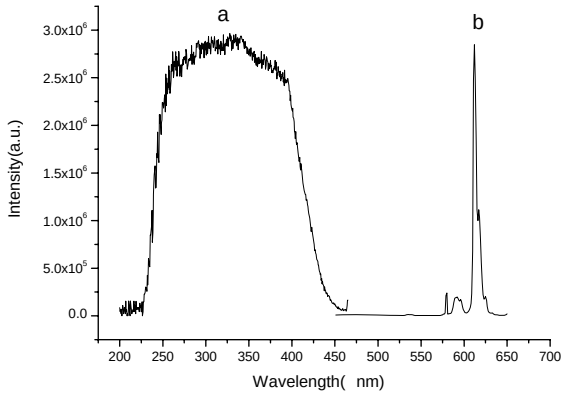


图1 Eu β_3L 粉末的激发光谱 (a, λ_{em}＝612 nm)和发射光谱（b, λ_{ex} = 395 nm)

Fig.1 Excitation spectrum (a, λ_{em}＝612 nm)
and emission spectrum of the complex Eu β_3L (b, λ_{ex} = 395 nm)

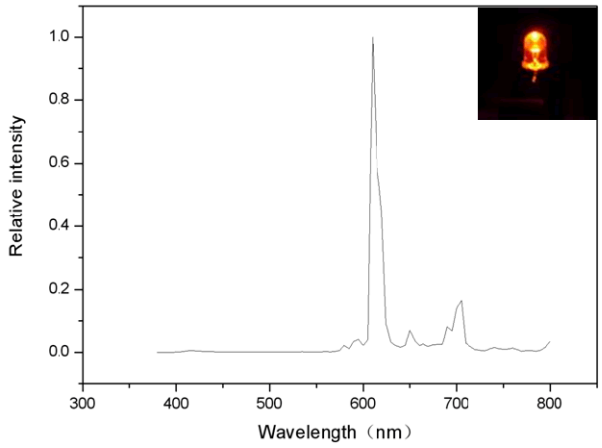


图 2 20 mA 正向电流激发下 LED 的发光光谱（内插图为该二极管发光照片）

Fig.2. The emission spectrum of the LED under 20 mA forward bias current
(Insert: Photograph of the lighting red LED)

稀土离子在钼酸盐 Gd2MoO6 纳米晶中的上转换发光

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摘 要：上转换发光纳米晶被认是一种很好的生物标定材料，能跟踪确定 DNA、RNA、蛋白质等生物分子，用于免疫、诊断、治疗等医学领域。由于生物分子之间的反应一般要在溶液中进行，因此生物标定材料的颗粒尺寸越小越好，而且能在溶液中具有很好的分散性，从而形成悬浮液。另外，生物分子并不吸收常用的 980 nm 的红外激光，也就是说，生物分子在近红外区是呈透明的，因此，使用无机上转换发光纳米晶作为生物标定材料，可能使检测灵敏度大大增加。本工作中，采用柠檬酸与乙二醇燃烧法合成了 Er3+/Yb3+离子掺杂的钼酸盐 Gd2MoO6 纳米晶，用 XRD 表征了其物相，TEM 显示其颗粒大小约为 60 nm，从其上转换发光强度随激光功率的变化关系可见，Er3+在其中的上转换发光属于双光子激发态吸收发光。

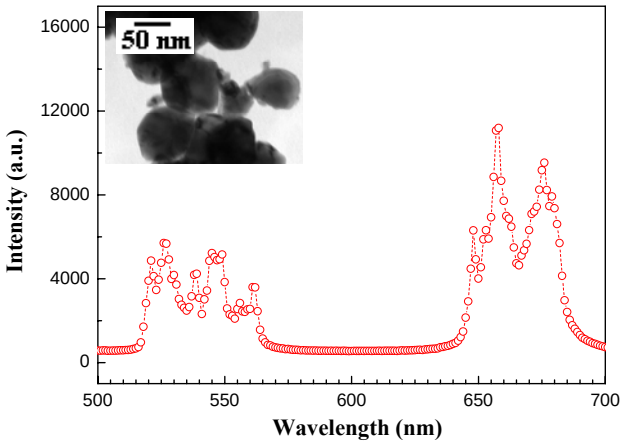


图 1 在 980 nm 激光泵浦下，稀土离子 Er^{3+}在钼酸盐 Gd_2MoO_6 纳米晶中的上转换发光，插图中为 Gd_2MoO_6 纳米晶的 TEM 图。

Upconversion luminescence of Er^{3+} and Yb^{3+} codoped Gd_2MoO_6 nanocrystals

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Abstract: Recently, inorganic upconversion luminescent (UL) materials, which could absorb two or more low energy photons (often in near infrared region) and emit UV or visible light, has received much interest due to the availability of low cost near-infrared (NIR) laser diodes. In

contrast to the traditional used fluorescent bio-probes, inorganic UL materials are more advantageous in application for bioassay since no fluorescence will be produced from biomaterials when exposed to near infrared region. Thereby, rare earth ions doped UL nanocrystals with particle diameters less than 100 nm have been drawn particular interest recently. Er^{3+}/Yb^{3+} codoped monoclinic Gd_2MoO_6 nanocrystals has been synthesized by a combustion method. The crystal structure and shape are explored by X-ray powder diffraction and scan (transmission) electron microscopy. The Gd_2MoO_6 nanocrystals obtained by combustion method show uniform particles with size about 60 nm. The dependence of the upconversion luminescence intensity on pump power has confirmed that the upconversion luminescence in Er^{3+}/ Yb^{3+} codoped monoclinic Gd_2MoO_6 nanocrystals are produced by two-photon excited-state absorption process.

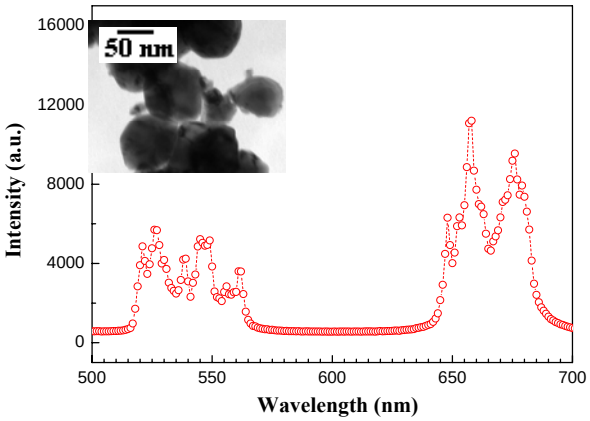


图 1 Upconversion luminescent spectra of nanocrystals $Gd_{1.76}Er_{0.04}Yb_{0.2}MoO_6$ upon excitation with 980 nm laser diodes and its TEM.

稀土元素在镁合金中的作用及研究进展

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摘 要：稀土以其特殊的物理化学性质在冶金及材料领域有着广泛的应用。本文主要综述了稀土元素对镁合金阻燃的作用机理和研究进展,以及稀土元素对镁合金微观组织结构的细化、高温力学性能的改善、耐蚀性能和耐高温性能提高等方面的作用机理和研究状况，并对稀土镁合金的应用前景作了展望。

关键词：稀土 镁合金 阻燃 微观组织 力学性能 耐蚀性能

The Development of Rare Earth Magnesium Alloy Research

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Abstract: Rare earth has been widely used in metallurgy and material fields for it- s special physical chemistry properties. In this article, the effects of rare earth during the process of magnesium and magnesium alloys preventing ignition are introduced, the influence and the correlative mechanisms of rare earth in refining the microstructures of magnesium, improving its mechanical properties at elevated temperature, corrosion and high temperature resistance are also reviewed.

Key words: Rare earth; Magnesium alloys; mechanical properties

Sm 掺杂 Ca-Co-O 基热电材料的制备与性能研究

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摘 要：采用溶胶-凝胶法制备了纳米级的 Sm 掺杂 Ca3-xSmxCo4O9 粉和不掺杂 Ca3Co4O9 粉，进一步制备了两种 Ca-Co-O 陶瓷热电材料，并利用 XRD、SEM 等方法分析表征样品，对其微观结构和热电性能进行了研究。实验结果表明，Sm 掺杂 Ca3-xSmxCo4O9 热电材料更加致密，气孔率较低，材料微观结构为定向排列的片状结构，晶粒生长完整，晶界完善，其热电性能较好，具有较高的 Seebeck 系数和较高的电导率，热功率因子随温度的升高而增大。

关键词： Ca3-xSmxCo4O9 ; 溶胶-凝胶法; 微观结构; 热电性能

Research on Properties of Ca-Co-O Thermoelectric Material with Adding Sm

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Abstract: $Ca_3Co_4O_9$ and $Ca_{3-x}Sm_xCo_4O_9$ powders were prepared by sol-gel process. The Ca-Co-O thermoelectric material ceramics were prepared.. The ceramics material were characterized by X-ray diffraction(XRD) and scanning electron microscopy(SEM). The microstructure and thermoelectric properties of ceramics were researched. The results indicate that the crystal of $Ca_{3-x}Sm_xCo_4O_9$ with Sm adding growth ideally , the material had high density and low pore rate. The $Ca_{3-x}Sm_xCo_4O_9$ ceramics contain directional array plate-shaped grains with layered structure. The thermoelectric properties of $Ca_{3-x}Sm_xCo_4O$ ceramics were excellent. There were high Seebeck coefficient and high electrical conductivity for $Ca_{3-x}Sm_xCo_4O_9$ ceramics. The power factor increased with temperature increasing.

Key word: $Ca_{3-x}Sm_xCo_4O_9$; sol-gel; microstructure ; thermoelectric properties

有机载体对 PDP 荧光粉亮度的影响

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（江苏省六大人才高峰资助项目；江苏省自然科学基金资助项目(BK2006561)）

摘 要：本文研究了有机载体中有机树脂、有机溶剂、有机助剂对荧光粉发光性能的影响。并就有机载体对荧光粉亮度的影响进行了分析。

关键词：有机载体　　PDP 荧光粉　　亮度

PDP 荧光粉层的光学模型计算

钟海涛 1　刘凯 2　梁超 1　何锦华 1

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（江苏省六大人才高峰资助项目；江苏省自然科学基金资助项目(BK2006561)）

摘 要：本文通过有关光学模型，从理论角度对荧光粉层发射光强度进行了计算，并且研究了当荧光粉层不同厚度时对发光面积的影响，最后作了分析比较。

关键词：荧光粉层　光学模型　厚度　发光面积

Optical Model Calculation of PDP Phosphor Layer

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Abstract： This paper calculated the emitted light intensity of PDP phosphor layer by the optical model. Studied the effect on luminescence area acted by the different thickness of PDP phosphor layer and analyzed the results.

Key words: PDP phosphor layer; optical model; thickness; luminescence area

稀土/功能化离子液体发光材料的合成

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摘 要：最近，新的溶剂体系——室温离子液体(Room Temperature Ionic Liquids, RTILs，常简称离子液体，ILs)已经发展成为学术界和工业界所关注的焦点。室温离子液是一种低熔点的有机盐，完全由离子组成，且其组成的离子一般是有机阳离子和无机阴离子。离子液体有着无嗅、低粘度、容易控制、宽液相温度(在特定条件下能达到 400℃)、几乎不存在气相压、热稳定性高、高电导率以及较宽的电化学稳定窗口等特别的性质。离子液体被称为“设计者的溶剂”，这种经设计满足专一性要求的离子液就是功能化离子液体。而在离子液体中嫁接各种官能团，实现离子液体的功能化以满足特定的要求是当今离子液体研究的前沿。通过设计，可以避免将 C-H，N-H，以及 O-H 等具有较高震动频率的键引入离子液体。多数离子液体没有颜色且在整个可见区和紫外区光学透明。这一优良的性能结合其比较高的稳定性使得离子液体特别适用于光学溶剂。另外，离子液体的离子性使得它们能够作为离子化合物包括稀土无机盐和稀土配合物的溶剂。含有金属离子的离子液体由于兼有离子液和相关金属离子的特定性质而有望成为新型先进功能材料。

由于其独特 4f 层电子构型，稀土离子具有优异的发光性能：色纯度高，荧光寿命长，发射谱线丰富包括可见区和近红外区。因此稀土化合物在在显示，光波导放大，固体激光器，医学，生物标记，防伪等领域有着潜在的应用价值。特别是稀土离子的近红外发光在光通讯上有广泛的用途。例如，Er3+离子的跃迁 4I13/2→4I15/2，发射波长为 1.54 μm 的近红外光，对应的是第三标准的通讯窗口波长，也是现在得到实际应用的玻璃光纤（或平面波导）的最低损耗传输窗口。因此结合离子液体优良的光学性能和稀土离子特殊的发光特性能及其广泛的用途无论从理论上还是从实际应用中都是一个值得去探索的研究课题。事实上，国际上已经有稀土化合物在离子液体中发光性能的研究报道。

本文利用带有羧酸基团的功能化离子液体能够溶解稀土氧化物和有机配体的特性，以该离子液体为单一溶剂，直接溶解稀土氧化物和有机配体，从而得到具有优异发光性能的软材料（见图 1）。详细研究了所得材料的技法光谱、发射光谱和荧光寿命，并根据所得数据计算出材料中稀土 Eu3+5D0 态的量子效率。

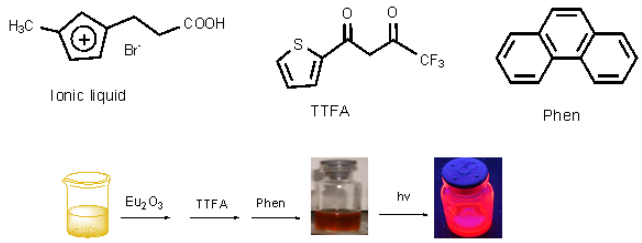


Figure 1 The ionic liquid and organic ligand used in this study (top); The procedure for obtaining lanthanide complex in ionic liquid (bottom)

La0.7-xNdxMg0.3Ni3.4Al0.1 (x=0～0.4) AB3.5 型储氢合金的制备及其电化学性能研究

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摘 要：采用真空烧结的方式制备了 La0.7-xNdxMg0.3Ni3.4Al0.1 (x=0～0.4)AB3.5 型储氢合金。XRD 分析表明，合金均由 LaNi5、La2Ni7 和 LaNi3 相三相组成。Nd 含量过高时，合金中的 LaNi3 相明显增加。电化学性能研究表明，适量的 Nd 元素能使合金的抗粉化能力得到提高，并改善合金电极的循环稳定性，La0.6Nd0.1Mg0.3Ni3.4Al0.11 合金最大放电容量达到 322.4mAh/g，循环 50 周的容量保持率（S50）达到 89.98%。实验结果表明合金中 LaNi3 相结构不利于合金综合电化学性能的提高，La2Ni7 相结构则有利于合金性能的提高。

关键词：钕，制备，电化学性能，相结构

Preparation and Study on the electrochemical performance of La0.7-xNdxMg0.3Ni3.4Al0.1 (x=0～0.4) AB3.5-type hydrogen storage alloy

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Abstract：La0.7-xNdxMg0.3Ni3.4Al0.1 (x=0～0.4) AB3.5-type hydrogen storage alloys were prepared by vacuum sintering method. XRD analysis showed that the alloys were mainly consisted of CaCu5-type LaNi5 phase, Ce2Ni7-type La2Ni7 phase and PuNi3-type LaNi3 phase. With the incensement of Nd element content, LaNi3 phase in the alloy structure was increased apparently. Electrochemical performance experiments showed that proper content of Nd element can improve the cycle life of the alloys. The maximum discharge capacity of La0.6Nd0.1Mg0.3Ni3.4Al0.11 alloy reached 322.4mAh/g and after 50 cycles, capacity retention rate（S50）got 89.98%. Experiments results implied that LaNi3 phase had negative effect on the electrochemical properties, while La2Ni7 phase had positive effect.

Keywords：N，Preparation，Electrochemical performance，Phase Structure3

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