2012奈米技術與材料研討會

Nanometer-Scale Technology and Materials Symposium 2012

會議手冊

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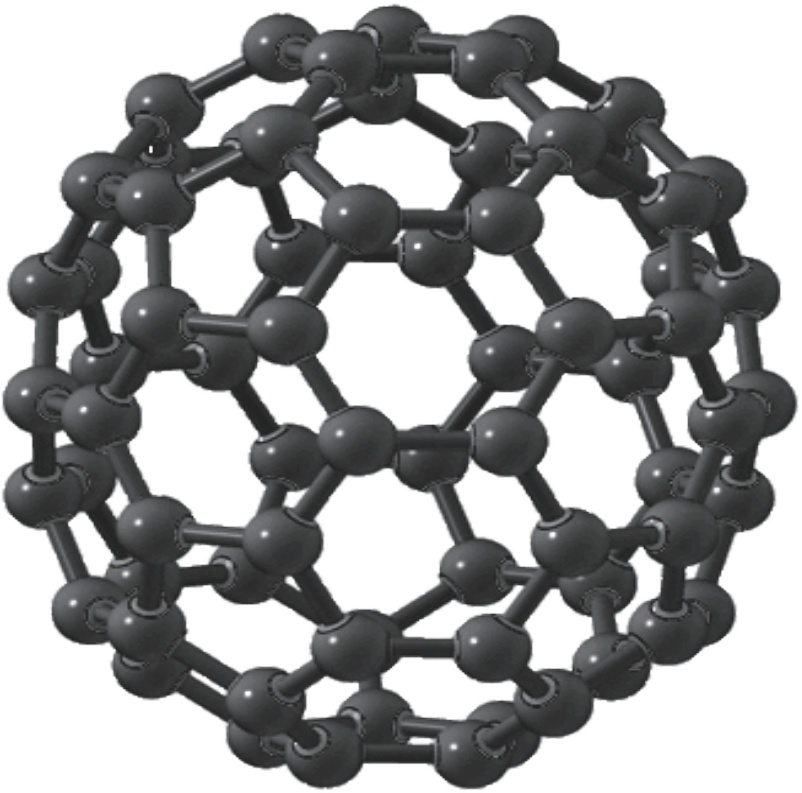

大葉大學 DAYEH UNIVERSITY

中華民國一百零一年十二月十四日

2012 年奈米技術與材料研討會

Nanometer-Scale Technology and Materials Symposium 2012

會議手冊

2012 年 12 月 14 日

2012 年奈米技術與材料研討會
Nanometer-Scale Technology and Materials Symposium 2010

為促進奈米尺度技術與奈米尺度材料相關領域之研究與學術交流，並協助人才之培育，自 2005 年起大葉大學每年舉辦本研討會，藉由相關研究之發表與討論分享，更加充實與增進彼此的知識。

舉辦時間：**2012 年 12 月 14 日（周五）**
舉辦地點：大葉大學工學大樓六樓會議廳 H613 室
主辦單位：大葉大學材料科學與工程學系、電機工程學系
指導單位：行政院國家科學委員會
議程主席：李得勝
籌備委員：李得勝、李世鴻、范榮權、宋皇輝、姚品全、李弘彬、
何文福、李義剛、廖芳俊、賴峰民、武東星、陳昭翰

大會邀請演講：

◎郭華丞 教授　（國立中興大學　物理學系、奈米科學研究所）
Electronic devices based on gold nanoparticles: device fabrication, charge conduction mechanism and applications

◎羅夢凡 教授　（國立中央大學　物理學系）
Nanoscale Fabrication: oxide strips and patterened clusters

◎陳麗文 助理教授　（國立臺中教育大學　科學應用與推廣學系）
奈米科技教育的成效評估

◎彭元興 教授　（大葉大學　環境工程學系）
絹雲母微米/奈米化製程開發及應用展望

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邀請演講摘要

L1

Electronic devices based on gold nanoparticles: device fabrication, charge conduction mechanism and applications

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Abstract

Gold (Au) nanoparticle (NP) films consisting of nanoparticles modified with self-assembled monolayers have many interesting electrical and optical properties. Many of these properties are strongly affected by the interparticle spacing that can be controlled by the lengths of ligand or linker molecules. Furthermore, NP films hold great potential for sensing applications, such as chemiresistor-type gas sensors. It is important to pursue a simple, efficient method to fabricate mono-and multilayer conductive AuNP films for novel electric, optoelectronic, and nanophotonic devices and chemical sensing applications. We have demonstrated that desirable monolayer and multilayer AuNP films can be achieved by using a simple centrifugal method. When the centrifugal method combines with conventional photo or electron-beam lithography methods and lift-off techniques, two and three-dimensional designed complex AuNP assembled structures can be fabricated.

The electrical conduction properties of AuNP films showed near-exponential distance decay with interparticle spacing, which can be controlled by the surface modification of AuNPs. Because of the competition of pronounced charging effect and interparticle tunneling, one can tune the interparticle spacing to study the Mott-Hubbard metal-insulator transitions. When the devices are close to the MIT, disorder-induced insulating state could be distinguished only at temperatures below 1 K. The insulating case showed a gate-controlled conduction that followed single-electron or resonant tunneling, revealing the presence of charge puddles in the AuNP films. We also report a class of stretchable devices fabricated from AuNP film on polyimide substrates. When the substrate is stretched or bended, the interparticle spacing is altered and results in the device resistance change. Such phenomenon is similar to the piezoresistance effect, which describes a change in electrical conductivity resulted from application of strain to a crystal. In our gold nanoparticle devices, the gauge factor could be as large as 100 when applied by a small strain of 0.5%. Such strain devices could find a wide range of applications in recreation, health care, and robotics.

L3

奈米科技教育的成效評估

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摘要

奈米科技教育自2003年以來，經教育部及國科會大力支持下，10年來逐漸推出各式的教案、創造出教具以及推廣的策略。為了要評估奈米科技教育的教學與推廣成效，因應也發展了評量的工具。本文主要探討評量方式及評量工具在奈米科技教育的應用。研究者由收集的教學報告中，分析其所使用多元評量模式，並探討評量的選用及施行方式；並從教師的教學方法與教學目標，來察看教師擬培育之基本素養與核心能力與選用評量方式的適切性。研究發現紙筆測驗仍為最常使用的評量方法及種類，而過程評量與技能評量則較少見諸於報告中，這與奈米科技教育教學目標的設定並不密切吻合。因此，有效的發展與運用評量工具在奈米科技教育仍需持續進行與關注。

關鍵詞：奈米科技，教學成效，評量

The Efficiency of Nanotechnology Education

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Abstract

From 2003, the plans of ministry of education and minister of national science council gave huge impetus to nanotechnology education. The lesson planning proposals, teaching aids and strategies for nanotechnology education were increase and rich. Therefore, the assessments to measure the teaching and learning effects have been developed. The aim of this study is wanted to discuss the methods and tools of nanotechnology assessments. By using content analysis method to view the teaching reports, the inspections of the choice and application of assessments were studied accompanied with the teaching designs. It was found that the utilization of paper exam is the highest method. Otherwise, the processing test and skill test were rarely being found. This phenomenon is not closely match the teaching goal of nanotechnology education. It is suggested that the assessments for nanotechnology should be continued developing and take an eye on it.

Key words: Nanotechnology, teaching & learning effect, assessment

L4

絹雲母微米/奈米化製程開發及應用展望

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摘要

絹雲母為台東本土無機片狀膨潤性層材，為國內相當具有開發潛力的礦源之一。本報告主要回顧絹雲母微米/奈米化製程的開發，以及微米/奈米級絹雲母應用的展望：1) 合金陶瓷雲母，2) 合金雲母，3) 無鐵雲母，4) 散熱工程塑料，5) 奈母雲母，6) 造紙產業等。

論文宣讀摘要

O1

數位教材設計-奈米材料科技

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摘要

本論文說明以數位教材設計「奈米材料科技」，上課方式將以「線上學習」來進行教學。課程主要以「數位教材設計-分析」內容中的「教學設計模式簡介」和「分析工作簡介」為主。數位教材開發過程中，「分析、設計、發展、建置、評鑑」五個階段的工作項目。分析的工作項目有：學習者、學習環境、現有資源、媒體、成本、目標和架構分析。設計的工作項目有：教學目標界定、教材架構設計、教學策略設計、風格與介面設計、雛型教材設計及教材開發標準制定。數位教材製作方法主要以串流大師、數位剪輯軟體，搭配數位錄影機、音效卡、顯示卡、高速 CPU 等設備，經由適當的數位影音剪輯、轉檔和壓縮後，可以提供學生遠端課程學習之機會。提供教師（助教）、學生必要之學習管理系統功能，和最新消息發佈、瀏覽。期末並且實施形成性評量(formative testing)，依次為檢驗小單元學習是否達到一定的學習水準，如果未達到要求的學習水準時，則回頭再學習一次，直到熟練為此。若學習成效一直無法達到熟練，就必須準備給予補救教學。形成性評量不列入學習成績，僅提供學生學習成效是否已形成了的參考而已。

關鍵詞：奈米材料，線上學習，數位教材，數位剪輯軟體，形成性評量

The Design of e-Learning - Nanomaterials Technology

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Abstract

This paper describes the design of e-Learning digital teaching “Nanomaterials Technology”, and the course will be “online learning” teaching. The course introduce “The Digital textbook design and analysis” and about content in “instructional design model” and mainly on analysis of the work. Digital e-Learning development process, including the work of five stages: analysis, design, development, implementation, and evaluation project. The analysis of the work of the project consisted of learners, learning environment, available resources, media, cost, objectives and framework for analysis. Design work: teaching objectives defined in textbooks architecture design, teaching strategies design, style and interface design, prototype materials design and Textbook Development standards development.Mainly by StreamAuthor, digital editing software, with a digital video recorder, sound card, graphics card, high-speed CPU and other equipment. Through the appropriate digital video and audio editing, file conversion and compression, the course can provide students with remote learning opportunities. Provide teachers and students learning management system functionality necessary, news release and browse, design teaching materials, view, and files download. Provide performance management and query system. Provide teachers and students in online testing, publish, learning information, interactive learning design in chat rooms. And to provide teachers and students presented a variety of teaching activities and other related functions. End of the semester and implement the formative testing, followed by a small unit of study to test whether a certain level of learning. If learning does not meet the requirements of the standard, then go back and study again until this proficiency. If the learning outcomes have not been able to achieve proficiency, we must be prepared to give remedial instruction. Formative testing is not included in achievement of the course, but only providing students learning outcome and reference.

Key words: nanomaterials, online learning, digital teaching materials, digital editing software, formative testing

O2

低溫下合成可見光光觸媒及其對甲基橙降解分析

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摘要

本研究以含浸法(impregnation method)的方式，於低溫下製作鉑、碳摻雜二氧化鈦(Pt-carbon-doped titanium dioxide)之可見光複合光觸媒，並以甲基橙溶液進行褪色降解測試。在研究中，以 XRD 及 TEM 觀測其結晶相態及晶粒之變化，以擴散反射光譜分析可見光吸收效果，並以 UV/Vis 吸收光譜來鑑定甲基橙之濃度降解效果。從實驗結果發現，經二小時可見光的照射，碳摻雜二氧化鈦可見光光觸媒之轉化率可達 56%，較市售可見光光觸媒效率更佳。然而，再經鉑摻雜改良，形成鉑、碳摻雜二氧化鈦之可見光複合可見光光觸媒，經二小時可見光的照射，轉化率可高達 87%，具有相當大的發展潛力。

關鍵詞：二氧化鈦，碳鉑摻雜，含浸法，可見光光觸媒

Preparation of Pt/carbon-doped visible-light TiO_2 at low temperature and its photocatalytic activity for degradation of methyl orange

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Abstract

In this study the visible-light photocatalysts of Pt-carbon-doped TiO_2 were prepared by the impregnation method at low temperature. The photocatalytic activity was evaluated by the degradation of methyl orange. Crystallization and morphology of the catalysts were characterized by XRD and TEM. Absorption of visible light and degradation of methyl orange were evaluated by diffuse reflectance method and Beer's raw. The experimental results showed that the conversion of decomposition of methyl orange under 2-h irradiation was 56% and 87% for the carbon-doped TiO_2 and the Pt-carbon-doped TiO_2, respectively, which are much higher that that for commercial visible-light photocatalysts and reveal their potential in practice application.

Key words: TiO_2, Pt-carbon-doped, impregnation method, visible-light photocatalyst

O3

單一晶型奈米二氧化鈦光觸媒的製備與鑑定

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摘要

本實驗是以$TiCl_4$作為先驅物，以溶膠-凝膠法(sol-gel)，藉由成核階段(nucleation)離子團間的反應控制，合成晶紅石(rutile)與銳鈦礦(anatase)兩種不同晶型的奈米TiO_2，作為後續光觸媒應用的先驅物質(precursor)。經由SEM、XRD、EDX……等儀器分析，可以鑑定其成分粒子的表面形貌與附著狀態、晶形結構與元素組成成分等，有助於爾後功能性載體光觸媒之合成與應用研究。

關鍵詞：二氧化鈦、四氯化鈦、載體、光觸媒

Preparation and Characterization of single phase nanocrystalline TiO_2 photocatalysts

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Abstract

Titanium oxides have been widely employed in photocatalysis for the decontamination treatment of pollutants in air and water. The pristine nanocrystalline TiO_2, owing to the lack of internal built-in electric filed to swift off charge carriers and suppressing the recombination of photo-generated charge carriers, suffer from extremely low charge carrier density. Therefore, the key role in improving the activity of these heterogeneous photocatalysts is to retard (slow) the recombination of photo-generated charge carriers. In this study, a novel concept for the preparation of supported TiO_2 photocatalysts was revealed. By employing $TiCl_4$ as precursor, a nanocrystalline TiO_2 photocatalyst was synthesized by sol-gel route in acidic aqueous phase with two different crystal phases, i.e., the pure TiO_2(rutile) and TiO_2(anatase, respectively. The pristine TiO_2 was further spread evenly onto a carrier (support) as supported catalysts. By annealing under ambient atmosphere at 450^oC for 1 hr., the supported TiO_2, as confirmed by SEM, XRD, SEM-EDX, had extremely small particle size of TiO_2 in the range of ~10 nm in diameter with pure crystalline phase. All TiO_2 were distributed evenly on the support surface.

The results indicated that the WRV increased with the stepwise increments of nano-sericite addition; in other words, the water retained by the color decreased. In particular, the SBR-130 nm group had WRV increases significantly greater than did those of SBR-185 and SBR-120 nm groups. The low-shear viscosities of the colors also increased with increasing proportions of nano-sericite added. When nano-sericite was added as a pigment ingredient, at 1% dosage, its effects on WRV and low-shear viscosity were maximized. Overall, addition the swelling nano-sericite decreased the retained water in the color and coalesced pigment particles to cause increased low-shear viscosity.

Key words: TiO_2, $TiCl_4$, support, photocatalyst

O4

以 Sol-gel NiO 阻障層修飾 TiO_2 工作電極之研究

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摘要

本實驗是以$Ni(CH_3COO)_2$為先驅物，使用Sol-gel法製備NiO薄膜作為阻障層(blocking layer)，以修飾染敏太陽電池(Dye-sensitized solar cells, DSSC)之TiO_2工作電極表面，抑制光生載子與液態電解質活性離子成分的逆向覆合(recombination)，進而提升DSSC光電轉換效率。透過薄膜退火所形成的P型半導體NiO薄膜，其形貌、晶型結構與所形成的阻障層，對於整體DSSC元件的光伏特性影響甚鉅。

在掃描式電子顯微鏡(FE-SEM)的照片顯示，TiO_2工作電極含有大量的孔隙，可增加染料的吸附。使用SEM-EDS進行元素成分分析，得知NiO薄膜有均一的披覆性，之後進行元件暗電流與光電效率量測，由I-V圖可以看到施加NiO阻障層的明顯作用，使DSSC的短路電流密度(J_{sc})，從15.04 mA/cm^{2}提升到18.72 mA/cm^2，光伏效率(η)也從3.89%躍升到5.69%。NiO阻障層的確實作用機制，將於後續研究中進一步探討。

關鍵詞：氧化鎳，溶凝膠法，染料敏化太陽能電池，阻障層

Modified TiO_2 electrodes with NiO blocking layer by Sol-Gel

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Abstract

In this study, nickel acetate was employed as precursor for a NiOx overlayer, prepared by sol-gel method, to modified TiO_2 working electrode surface (designated as TiO_2/NiO_x) of dye-sensitized solar cells (DSSC). The NiO_x overlayer, as a blocking layer over nanostructured TiO_2 electrode, suppressed the transport of photoelectrons from TiO_2 to the electrolyte and improves the conversion efficiency of DSSC substantially.

The FE-SEM micrographs revealed that the TiO_2/NiO_x electrodes contain lots of voids to facilitate the absorption of dye. By SEM-EDS analysis, the distribution of Ni atoms confirms to be very uniform. The *IV* curves of the cells measuring under standard AM 1.5 illumination revealed that J_{sc} increased from 15.04 mA/cm^2 to 18.72 mA/cm^2 whereas photovoltaic conversion efficiency(η%) elevated considerably from 3.89% to 5.69%.

Key words: dye-sensitized solar cell, NiO, sol-gel, blocking layer.

蠶絲蛋白/玻尿酸/幾丁聚醣不同混合比以靜電紡絲探討奈米纖維之研究

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摘要

本研究以不同比例之蠶絲蛋白及幾丁聚醣高分子溶液，並改變玻尿酸濃度於靜電紡絲製備出奈米纖維薄膜。而傳統敷料中，如：棉花、紗布由於易沾黏釋出的組織液，換藥時也會使得傷口產生二次傷害。本研究針對不同濃度玻尿酸與幾丁聚醣探討靜電紡絲薄膜保濕性改善傳統敷料之缺點，並利用SEM表面觀察纖維結構及黏度測試纖維成絲性。由實驗結果得知，隨著玻尿酸濃度提高，會使纖維結構呈規則網狀且均勻排列。而隨著玻尿酸添加量增加希望使纖維均勻成絲。此一製作方式因使用天然蠶絲，不僅環境安全，且生物相容性頗為優良，尤其不需再以化學藥劑進行親水化接枝及交鏈作用，有更加的生物安全性。

關鍵詞：靜電紡絲、蠶絲蛋白、玻尿酸、幾丁聚醣

Preparation and Study on Properties of Nanofibers Membrance of Silk fibron/Hyaluronic acid/Chitosan by Electrospinning Method

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Abstract

This study on adding various mixing ratio of chitosan/hyaluronic acid into silk fibroin and nano fiber membrane was prepared by electrospinning. The traditional dressing, such as: cotton, gauze due to easy adhesions release the tissue fluid, dressing also makes the wound to produce secondary damage. In this study, for the different concentrations of hyaluronic acid and chitosan explore the electrospinning film to improve the shortcomings of the traditional dressing, then use SEM to observe the fibers structure and viscosity fiber. The results showed, the hyaluronic acid concentration increased, will make fiber structure were rules mesh uniformly arranged. The nano fiber membranes made from mixture of silk fibroin/ hyaluronic acid /chitosan were environmental and available for biomaterials, without further hydrophilization grafting and cross chain with chemicals, have more biological safety.

Key words: electrospinning, silk fibroin, hyaluronic acid, chitosan

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靜電紡絲製備聚醯胺/奈米銀複合纖維抗菌性之研究

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摘要

本研究係以奈米銀纖維添加在聚醯胺高分子溶液當中，均勻分散後，進行靜電紡絲，製作出具有抗菌性之奈米纖維薄膜。藉由改變奈米銀纖維添加量探討奈米纖維薄膜之抗菌性，並且改變紡絲電壓與紡絲工作距離，利用電子顯微鏡觀察纖維之變化。由研究中發現不同的電壓對靜電紡絲纖維細度大約都在 0.34 至 0.36 μm 之間，故影響並不大，但工作距離越長纖維細度會越細，當工作距離在 25 cm 時，達到纖維最細 0.224 μm，添加奈米銀纖維會使高分子溶液濃度上升纖維細度變大，當奈米銀添加量達到 5%，會使纖維細度達到最大 0.38 μm，另外隨著奈米銀纖維添加比例增加，會使纖維細度上升且抗菌效果上升，在奈米銀纖維添加量為 5wt%時對於金黃色葡萄球菌滅菌率最佳可達 89.6%，對於大腸桿菌滅菌率最佳可達 91.7%。

關鍵詞：靜電紡絲、聚醯胺纖維、奈米銀纖維、抗菌性

Preparation of polyamide/nanosilver composite fiber antibacterial by electrospinning

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Abstract

This study is to test the result of adding nanosilver shapes into Nylon polymer solution and then doing the process of electrospinning after dissolving, in order to refine the antibacterial nanofiber membrane. By adjusting the amount of nanosilver shapes to discuss the degree of antibacterial nanofiber membrane is the aim. In addition, varying the two factors, spinning voltage and spinning working distance, a scanning electron microscopy will be used to note the importance. Thus, different spinning voltage has less impact on the fineness of fiber,the diameter about 0.34 to 0.36 μm,whilst the enhancing of spinning working distance lowers the fineness of fiber, when the working distance in 25 cm achieve the finest fibers 0.224 μm. when the nanosilver add 5% will make fiber fine large maximum 0.38 μm, Moreover, with the increasing changing of the proportion of nanosilver shapes, the fineness of fiber and the effects of antibacterial also improve upward, when the nanosilver add 5%, ultimately leads to the sterilization rate toward the staphylococcus aureus of 87.6% and E. coli of 91.7%.

Key words: electrospinning, polyamide fiber, nanosilver, antibacterial

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靜電紡絲製備聚醯胺/奈米銀複合纖維抗電磁波之研究

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摘要

本研究以奈米銀纖維加入尼龍高分子溶液進行靜電紡絲來製作薄膜，並經由 SEM 觀察表面與纖維細度，並且測試抗電磁波比較添加奈米銀纖維對抗電磁波的影響。由研究中發現不同的電壓對靜電紡絲纖維細度大約都在 0.34 至 0.36 μm 之間，故影響並不大，但工作距離越長纖維細度會越細，當工作距離在 25 cm 時，達到纖維最細 0.224 μm，添加奈米銀纖維會使高分子溶液濃度上升纖維細度變大，當奈米銀添加量達到 5%，會使纖維細大達到最大 0.38 μm，而添加奈米銀的比例越高電磁波的吸收值則越高，當奈米銀添加量達到 5%，電磁波的吸收值達到 12.9dB。

關鍵詞：靜電紡絲、聚醯胺纖維、奈米銀纖維、電磁波吸收值

Preparation of polyamide/nanosilver composite fiber electromagnetic wave by electrospinning

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Abstract

In this study, we used nanosilver shapes added to the nylon polymer solution for electrospinning to produce films, SEM observation of surface changes and fiber diameter and testing of electromagnetic wave absorber of adding nanosilver shapes, to comparison of effects of electromagnetic waves. In this work,different voltages on the electro-spinning fiber diameter is little effect,thediameterabout 0.34 to 0.36 μm , but the enhancing of spinning working distance lowers the fineness of fiber,when the working distance in 25 cm achieve the finest fibers 0.224 μm. Add nanosilver shapes polymer solution the fiber diameter bigger,when the nanosilver add 5% will make fiber fine large maximum 0.38 μm,the higher the proportion of the nanosilver shapes the higher the value of the absorption of the electromagnetic wave ,when the nanosilver add 5%, the absorption of electromagnetic waves reaches 12.9 dB.

Key words: electrospinning, polyamide fiber, nanosilver, electromagnetic wave

O8

添加奈米銀纖維對聚酯織物抗靜電性之研究

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摘要

本研究係以奈米銀纖維經後處理方式對聚酯織物進行加工，首先將奈米銀纖維與水性 PU 樹酯摻合均勻分散後，對聚酯織物進行加工處理，製得具有靜電消散之機能性產品。藉由改變奈米銀纖維添加量探討其抗靜電性，並以電子顯微鏡觀察其外觀變化。由研究發現奈米銀濃度越高電阻係數越低，亦即抗靜電效果越佳，且隨著水洗次數增加，聚酯加工布表面上之銀纖維越明顯，在經 20 次耐水洗測試後電阻值僅為 10^2 Ω/□，亦即仍保有良好之靜電消散能力。

關鍵詞：聚酯織物、奈米銀纖維、靜電消散

The nanosilver fiber added to the polyester fabric antistatic

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Abstract

In this study, the multifunctional polyester fabrics treated with nanosilver fiber to be processed. The nanosilver fibers and water-based PU resin were uniformly blended into solution. The effect concentration of nanosilver pick up ratio of fabrics on antibacterial and static dissipation were researched. The surficial phenomena of treated fabrics were observed by scanning electron microscope. From experimental results found the surficial electric resistance of finished fabric decreased with the increasing of concentration of nanosilver solution, that mean the antistatic function of fabrics were improved. The electric resistance of samples after washing were decreased. That still maintain the better ability of static dissipation for the treated fabrics in many washing tests.

Key words: polyester fibers, nano-silver fibers, static dissipation

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以微機電製程製作非對稱 OADM 元件

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摘要

本研究以微機電技術(Microelectromechanical Systems, MEMS)製作光波導元件，並使用全像干涉微影技術(Holography Interference Lithography)製作奈米級光柵於光波導元件上，最後再結合軟式微影技術(Soft Lithography)來製作光塞取多工器(Optical Add/Drop Multiplexer, OADM)元件。

在本文的實驗系統中，我們先以黃光微影製程製作光波導，再配合軟式微影技術中的微接觸印刷(Micro-contact Printing)以及複製成形技術(Replica Molding)，翻印光波導元件，此翻印技術可達到大量生產的效果，將製程簡易化並有效降低成本，再使用全像干涉微影技術，將奈米級的布拉格光柵製作於光波導導光層的底部，使其成為一 OADM 元件，並對此 OADM 元件加以量測，以近場量測系統與光頻譜分析儀測量此 OADM 元件之光學傳輸特性。

研究中以原子力顯微鏡(Atomic Force Microscope, AFM)、場發射掃描式電子顯微鏡(Field-Emission Scanning Electron Microscope, FE-SEM)等方式觀察與探討其 OADM 元件結構。

關鍵詞：全像干涉微影技術、軟式微影技術、OADM 元件

The MEMS Process to Produce Asymmetric OADM Components

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Abstract

In this study, we proposed a MEMS process to fabricate optical add/drop multiplexers. In this proposed process, the holographic interference lithography was employed to produce nanoscale grating on the OADM devices.

First, we used photolithography to produce optical waveguide pattern, formed on a glass substrate, of negative resist, after that, the micro-contact printing of soft lithography and replica molding were employed to reprint the optical waveguide components on a polymer substrate. Second, by using holographic interference lithography, the nanoscale Bragg grating was formed on one of the core regions of the device. Final, the optical characteristics were investigated by using Near-field Measurement System and Spectrum analyzers and the device structure and grating profile were measured by optical microscopy and atomic force microscopy, respectively as well.

Key words: holography interference lithography, soft lithography, OADM components

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以射頻磁控濺鍍法在不同濺鍍功率條件下製備氧化鋅摻雜鋁(AZO)薄膜

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摘要

本研究使用射頻磁控濺鍍法 (RF Magnetron Sputtering)，以不同射頻功率(100 – 300 W)為製程條件探討氧化鋅摻雜鋁(Aluminum-doped ZnO, AZO)薄膜之材料與光電特性。在材料、光電分析上，本研究將使用 α-step、XRD 繞射分析儀、可見-紫外光光譜儀、霍爾量測儀、四點探針儀，分析該 AZO 薄膜的厚度、結晶方向、光穿透率、載子遷移率、載子濃度和導電性。本研究之結果顯示，在不同濺鍍功率的 AZO 薄膜皆具有(002)繞射峰值，且為多晶的纖鋅礦(Wurtzite)結構。在射頻功率為 300 W 時所製備之 AZO 薄膜，其特性在可見光範圍內(300 ~ 800 nm)之平均透光率約 94.2 %，其最佳電阻率為 8.98×10^{-4} Ω-cm，遷移率為 3.52 cm^2/V-s 以及載子濃度 2.97×10^{20} cm^{-3}。該 AZO 薄膜之光電特性顯示其相當適用於低成本薄膜型太陽電池結構中。

關鍵詞：氧化鋅摻雜鋁，射頻磁控濺鍍、透明導電氧化物，濺鍍功率

Effects of RF Power conditions on Aluminum-doped ZnO (AZO) Thin Films

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Abstract

In this study, transparent conductive Al doped zinc oxide (ZnO:Al, AZO) thin films by using radio frequency (RF) magnetron sputtering. The materials and Opto-Electronics properties of the AZO thin films are investigated at different RF sputter power (from 100 to 300W). In the study were materials and Opto-Electronics analyzed by α-step, XRD diffractometer, UV-VIS spectrophotometer ,Hall measurements and four point prober for deposition rate, crystallinity, transmittance mobility, carrier concentration and electrical properties, respectively. The results show that the AZO thin films with different power have (002) peaks and polycrystalline wruzite structure; the average transmission ratios of deposited AZO thin films in the visible range (300 ~ 800 nm) were above 94.2 %, the best resistivity of 8.98×10^{-4} Ω-cm, mobility of 3.52 cm^2/V-s and carrier concentration of 2.97×10^{20} cm^{-3} in the sputtering power of 300 W. The optical and electrical properties of the AZO thin films is suitable for low cost thin film solar cell structure.

Key words: Al-doped ZnO, RF magnetron sputtering, transparent conductive oxides, sputtering power

利用射頻磁控濺鍍法探討在不同基板溫度和濺鍍功率之氧化鋅摻雜鋁（AZO）薄膜

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摘要

本研究中，利用射頻磁控濺鍍機沉積厚度為 40 nm 的氧化鋅摻雜鋁(AZO Thin Films)之透明導電薄膜於康寧玻璃基板上。其探討在不同基板溫度(27 ~ 150 ℃)和濺鍍功率(150 ~ 250 W)時，AZO 薄膜在材料、電特性及光特性之變化。其結果顯示在基板溫度 70 ℃和濺鍍功率為 250 W 得到電阻率 7×10^{-4} Ω-cm (1.754 Ω/sq)和在可見光範圍(300 ~ 800 nm)的透光率大約在 78 %(約為 415 nm) ~ 92.5 %(約為在 630 nm)。則本實驗製備之 AZO 薄膜所觀察到的材料、光電特性是相當適用透明導電極之應用。

關鍵詞：氧化鋅摻雜鋁，射頻磁控濺鍍機、透明導電氧化物、濺鍍功率

Characterization of aluminum-doped zinc oxide thin films by RF magnetron sputtering at different substrate temperature and sputtering power

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Abstract

In this study, transparent conductive Al doped zinc oxide (ZnO: Al, AZO) thin films with a thickness of 40 nm were prepared on the Corning glass substrate by radio frequency magnetron sputtering.The properties of the AZO thin films are investigated at different substrate temperatures (from 27 to 150 °C) and sputtering power(from 150 to 250 W). The structural, optical and electrical properties of the AZO thin films were investigated. The optical transmittance of about 78 % (at 415 nm) ~ 92.5 % (at 630 nm) in the visible range and the electrical resistivity of 7×10^{-4} Ω-cm (175.2 Ω/sq) were obtained at sputtering power of 250 W and substrate temperature of 70 °C.The observed property of the AZO thin films is suitable for transparent conductive electrode applications.

Key words: Al-doped ZnO, rf magnetron sputtering, transparent conductive oxides, sputtering power

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以化學水浴法成長硫化鎘薄膜：沉積時間的探討

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摘要

銅銦鎵硒太陽能電池緩衝層材料有相當多種，但是其中以硫化鎘做為緩衝層材料有較高的匹配性及其效率最高，使用濕式化學薄膜沉積法-化學水浴沉積法製備硫化鎘薄膜，探討沉積時間對於成長硫化鎘薄膜的影響。實驗結果可得知隨著沉積時間的提高，表面硫化鎘顆粒也隨之變大。沉積時間30分鐘到70分鐘，隨著沉積時間上升厚度沉積速率由2.63 nm/min下降為1.31 nm/min。再進行光學量測隨著厚度的提升，穿透度也隨之下降，能隙隨著時間的由2.34上升為2.38，有些許提高。由X射線光電子能譜(XPS)分析，結果顯示$Cd(OH)_2$隨著沉積時間產生。

關鍵詞：硫化鎘、化學水浴沉積法、緩衝層 、銅銦鎵硒太陽能電池

Growth of CdS thin films by chemical bath deposition: discussion of the deposition time

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Abstract

CIGS solar cell buffer layer material is quite multiple, in which the CdS as the buffer layer material has a higher matching and highest efficiency. The preparation of cadmium sulfide (CdS) film is used wet chemical film deposition - Chemical bath deposition, to explore the effect of deposition time for the growth of CdS thin films. The experimental results can be obtained that with the improvement of the deposition time, and increased in the surface of CdS particles. To increase in deposition time from 30 minutes to 70 minutes, and decreased in the addition thickness deposition rate, from 2.63nm/min to 1.31nm/min. Then carry out optical measurement, increase in the thickness, and decreases in the transmittance. The energy gap has be improved slightly as time increased from 2.34 to 2.38. The analysis results showed that $Cd(OH)_2$ is generated with deposition time by X-ray photoelectron spectroscopy (XPS).

Key words: CdS, chemical bath deposition, buffer layer, CIGS solar cell

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壁報論文摘要

P1

PVA 梳狀結構高分子與蛋白質吸附之 AFM 表徵

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摘要

蛋白質吸附是臨床上敷料沾粘與傷口感染之主要問題來源，因此降低蛋白質吸附是所有與組織液/體液接觸之醫療器材必須解決之重要問題。本研究計畫開發PVA-g-PEG-co-PU之雙性表面塗佈材料，塗佈在PU基板上，希望能具有表面抗蛋白質沾黏及防脫落的特性。製程結果須達成高PEG表面覆蓋密度、防止PEG與PVA產生糾結及PU段的脫附造成基材的裸露等三個條件，這些結果的定量鑑定方法的建立是相當重要的。本文主要描述如何利用化學力顯微鏡技術，由掃描所得的地貌、剛性及黏彈力等特性，來分析PEG的表面覆蓋密度、表面型態及裸露面積，進一步利用蛋白質修飾探針直接量測蛋白質與敷材間的力學行為，這方法可避免外界環境汙染所造成的不確定性，精確量測到敷材與組織間的沾黏特性。

關鍵詞：聚乙烯醇(PVA)，梳狀結構共聚物，蛋白質吸附，原子力顯微鏡

AFM characterization of PVA brush polymer and their resistance to protein adsorption

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Abstract

It is well known that protein absorptions are responsible for the most infection and dressing adherent therefore causing failure to heal. The absorption of protein can be minimized by surface modification. This project developed the bi-function surface coated material of PVA-g-PEG-co-PU (PVA brush copolymer) and coated on the PU substrate. It hopefully gets the performance of protein anti-adhesion and preventing the coated material peeled off. There are three conditions need to satisfy: high PEG packing density, prevented the entanglement between PEG and PVA and exposed the PU substrate due to low adhesion of PU segment. It is very important how to identify and detect these phenomena. This article illustrated how to use chemical force microscopy (CFM) to analyze PEG surface packing density, surface morphology and exposed substrate area. Furthermore, we also directly measured the mechanical interaction between protein and biomaterial by using the protein modified AFM's tip. This method can prevent environmental pollution to cause the measured uncertainty and exactly measure the adhesion performance between biomaterial and tissue.

Key words: polyvinyl alcohol, brush copolymer, protein adsorption, AFM

P2

奈米膠體金對生化轉化效率之研究

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摘要

本研究應用奈米膠體金 (Colloidal Gold, CG) 於盤尼醯林醯胺酵素 (penicillin G acylase, PGA) 進行 PGA 轉化效率影響之研究。首先製作不同粒徑 CG，利用其添加量、pH 值和溫度，探討上述因素對反應轉化效率之影響。實驗結果證實添加膠體金可增加 PGA 酵素活性。其最佳添加條件為：添加 0.05ml CG 溶液 (D=10.0nm)，在 pH8、37℃條件下，PGA 酵素活性較未添加膠體金的增加 4.2 倍。另實驗發現蛋白質吸附在 CG 上的量不多，因此判斷 CG 添加效應為增加熱傳遞效果，因而降低 PG 水解反應的活化能 (降低 11.7%)，且將 CG 經由離心重複使用，再加入 PGA 酵素仍有增加活性的效果。

關鍵詞：膠體金，盤尼醯林醯胺酵素，奈米，活化能

Study of nano-colloidal gold to the bioconversion efficiency

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Abstract

In this study, this research is focus on application of nano-colloidal gold (CG) on Penicillin G Acylase (PGA) conversion efficiency. Firstly, this research produces various CG particle sizes and use different additions, pH and temperature to explore influences of these factors on reaction conversion efficiency. The experimental result demonstrates that adding CG can increase PGA enzyme activity. The optimal conditions are as follows: adding 0.05ml of CG solution (D = 10.0nm) under the conditions of pH 8 and 37°C, the PGA enzyme activity increased 4.2 folds than those without adding CG. Another result found that the amount of protein adsorbed on the CG is not numerous; therefore, the addition of CG increases the efficiency of heat transfer, lowering the activation energy of the PG hydrolysis reaction (11.7% reduction). Moreover, after reusing CG via centrifugation, adding PGA still has effects on increasing of the PGA activity.

***Key words*:** colloidal gold (CG), Penicillin G Acylase (PGA), nano, the activation energy

P3

液中硬化法製備海藻酸鈣包覆油性染料微膠囊之研究

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摘要

本研究利用液中硬化法來進行海藻酸鈣包覆油性染料微膠囊的製備。以油性染料芥黃為芯材，海藻酸鈉作微膠囊的殼材。實驗中先將海藻酸鈉粉末配製成1%、1.5%、2%、2.5%海藻酸鈉膠體，氯化鈣配製成2%的氯化鈣水溶液，將海藻酸鈉膠體和油性染料芥黃以5:1、10:1、50:1三種不同殼芯比之混合液，再分別以500 rpm攪拌速度將其分散，再將不同比例混和之溶液置入噴槍中，再噴入2%氯化鈣水溶液中進行交鏈硬化形成微膠囊實驗樣本。將最好的樣本再利用不同氯化鈣濃度進行微膠囊成行性及粒徑之探討。文中探討改變海藻酸鈉膠體、改變殼芯比和改變氯化鈣濃度對微膠囊成形性及粒徑的影響。結果顯示以海藻酸鈉1.5%、殼芯比為15:1的成形性較佳，則粒徑為137.99 ± 10.83μm。

關鍵詞：微膠囊、液中硬化法、海藻酸鈉、氯化鈣

The liquid hardening prepared calcium alginate coated oily dye microcapsules

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Abstract

In this study, the solution hardening method for the preparation of calcium alginate coated oily dye microcapsules. To the oily dye mustard yellow as the core material, sodium alginate microcapsules shell material. Experiment the first alginate powder formulated as a 1%, 1.5%, 2%, 2.5% sodium alginate colloid, calcium chloride, formulated as an aqueous solution of 2% calcium chloride, the alginate colloids and oily dye mustardyellow 5:1,10:1,50:1 three different shell core than the mixture, then were dispersed 500 rpm stirring speed gun, and then placed in a solution mixed in different proportions, and then injected into a 2% chlorineaqueous solution of calcium, the hardening of the linkage to form microcapsules experimental samples. The best samples using different concentration of calcium chloride to make the trip and the particle size of microcapsules explore. Text explore to changing sodium alginate colloidal change the shell core than changing the impact of calcium chloride concentration the formability and particle size of the microcapsules. The results showed 1.5% alginate, the shell core ratio of 15:1 formability preferred, then the particle size was 137.99 ± 10.83μm.

Key words: microcapsules, liquid hardening method, sodium alginate, calcium chloride

P4

熱處理對幾丁聚醣微膠囊包覆檸檬精油之製備及其成形性之探討

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摘要

本研究以食品級幾丁聚醣為殼材，檸檬精油為芯材，經由液中硬化法製備幾丁聚醣W/O型微膠囊，並以80°C之去離子水隔水加熱10 min，探討熱處理對微膠囊成型性之影響。將幾丁聚醣粉末溶於2%醋酸水溶液中配製成3%、3.5%、4%之幾丁聚醣膠體，以油性染料將檸檬精油染色後，與幾丁聚醣膠體以1:15之殼芯比混合，先以1000 rpm進行第一段分散後，再以10000 rpm進行第二段分散形成懸浮液，滴入3%之氫氧化鈉水溶液中進行交鏈，製成微膠囊；取3.5%之幾丁聚醣膠體與染色之檸檬精油分別以1:10、1:15、1:20之殼芯比混合，製成微膠囊；改變第二段轉速為8000 rpm ~ 12000 rpm進行分散，探討不同濃度之幾丁聚醣、改變殼芯比及改變第二段轉速對微膠囊成形性之影響。結果顯示，以3.5%幾丁聚醣膠體，並1:15之殼芯比與精油混合之成形性最佳，而熱處理使幾丁聚醣表面孔洞縮小，有助於減緩精油之釋放。

關鍵詞：液中硬化法、W/O型微膠囊、殼芯比

Heat Treatment Study of preparation of chitosan microcapsules coated lemon essential oil and its formability

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Abstract

Food grade chitosan shell material, lemon essential oil as a core material via solution hardening Preparation of chitosan W/ O type microcapsules, and 80°C de-ionized water impermeable heating 10min exploreHeat Treatment of microcapsules forming. Chitosan powder was dissolved in 2% aqueous acetic acid preparation of 3%, 3.5% and 4% of the chitosan colloid, oil dye lemon essential oil stained colloidal chitosan 1:15 the shell core mixing ratio, and the first to 1000 rpm after the first paragraph of the dispersion, and then at 10000 rpm second dispersed to form a suspension, cross-linking of 3% sodium hydroxide aqueous solution was added dropwise, to prepare microcapsules; 3.5% chitosan colloid and dyed lemon essential oil made of mixed 1:10, 1:15, 1:20 shell core microcapsules; changing the second paragraph of the speed 8000 rpm ~ 12000 rpm disperse explore different concentrations chitosan change the the shell core ratio and the change of the second paragraph of the speed of microcapsules formability. The results showed that the 3.5% chitosan colloid, and 1:15 the shell core than with essential oils mixed formability, and the heat-treated the chitosan surface pores shrink, to help slow the release of essential oils.

Key words: solution hardening method, W/O type micro capsules, shell core ratio

電漿改質明膠粒子之成形性探討

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摘要

本研究以射頻(RF)電漿轟擊及表面蝕刻之方式處理明膠試改變其親水性，具疏水性之明膠能延緩其在水中溶解之速度，實驗中探討以濃度為10%的明膠製成粒子並分別使用氬氣、氧氣、氮氣之電漿改質；瓦數功率30、60、90、120、150、180、210瓦；電漿時間1、3、5、7、9分鐘；水溫40°C。實驗結果顯示：以氬氣進行電漿改質時，瓦數越高溶解時間越快，時間越久溶解時間越短；以氧氣改質時，明膠表面產生活化點，暴露於空氣中生成過氧化基；以氮氣改質時，更證明了可使材料表面變為較親水性，較前兩者氣體溶解更快。數據顯示，以氧氣電漿改質大幅提升在水中溶解時間，結論，目前以電漿功率90瓦，電漿時間5分鐘，水溫為40°C，能製出疏水性最佳之電漿粒子，並使用電子顯微鏡(SEM)觀測明膠顆粒表面，說明本實驗利用電漿中的蝕刻特性改質。

關鍵詞：射頻電漿、蝕刻、明膠、疏水性

The plasma modified gelatin nanoparticles formability explore

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Abstract

The study to radiofrequency (RF) plasma bombardment and surface etching treated gelatin test changes its hydrophilicity, hydrophobicity of the gelatin can delay the speed of its dissolution in water, of a concentration of 10% of the gelatin particlesand argon, oxygen, nitrogen plasma modified; Wattage power 30, 60, 90, 120, 150, 180, 210 W; Plasma time of 1, 3, 5, 7, 9 minutes; The water temperature of 40°C. The experimental results show that: Argon plasma modification, the higher the wattage, the dissolution time the faster the longer dissolve the shorter the time; In the the oxygen modified, the gelatin surface activation point, to generate peroxide group on exposure to air; Nitrogen modified allows material surface becomes more hydrophilic than the first two gas dissolved faster. The data show that increased dramatically in the dissolved oxygen plasma modification. Conclusion, the current plasma power of 90 watts, the plasma time of 5 minutes, the water temperature was 40°C, the system can be a hydrophobic plasma particles using Scanning Electron Microscopy (SEM) to observe the surface of the gelatin particles, to illustrate the present experimentplasma etch characteristics modified..

Key words: RF plasma, etching, gelatin, hydrophobic

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以溶膠-凝膠法製備介孔 $CaO-B_2O_3-SiO_2$ 與其生物活性之研究

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摘要

為了提高骨組織的修復，需增加氫氧基磷灰石的生成速率，而材料的微結構，會影響氫氧基磷灰石層的生成速率與效果。本研究以非離子型界面活性劑為天然有機模板，四乙矽酸鹽、硝酸鈣和硼酸三丁酯為反應物，利用溶膠-凝膠法製備高比表面積之介孔$CaO-B_2O_3-SiO_2$生醫玻璃。由熱重分析結果可知，當煅燒溫度達500 ºC 以上，即可合成介孔$CaO-B_2O_3-SiO_2$生醫玻璃。在Ca：B比例1.6：2，煅燒溫度550~650 ºC製備出之介孔$CaO-B_2O_3-SiO_2$生醫玻璃具有高的比表面積。從XRD分析結果得知，在浸泡SBF 4hr後，從無固定晶相之Si-O轉變成氫氧基磷灰石微晶，在SEM圖中，也呈現了明顯的結晶相，說明有氫氧基磷灰石相的存在。

關鍵詞：氫氧基磷灰石，生醫玻璃，溶膠-凝膠法，介孔材料

Preparation of Mesoporous $CaO-B_2O_3-SiO_2$ and Its Bioactivity Behavior by Sol-gel Method

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Abstract

In order to improve the biocompatibility between the implant and the bone tissue, a biologically active hydroxyapatite layer is formed at the implant-tissue interface. The deposition rate and performance of the hydroxyapatite layer was dependent on the structure of bioglass. In this study, mesoporous $CaO-B_2O_3-SiO_2$ with high specific surface area was prepared by sol-gel process and the synthesis was accomplished by using nonionic surfactant (triblock copolymer) as the template, tetraethyl orthosilicate, tributyl borate and calcium nitrate tetrahydrate as the inorganic precursors. TGA analysis showed that the calcination in air at temperature above 500 ºC was needed to remove the surfactant completely from the mesopores. The mesoporous bioglasses also showed a high specific surface area at 550~650 ºC calcination for Ca:B ratio of 1.6:2. The XRD results reveal that amorphous hydroxyapatite layer started to form on the surface after mesoporous bioglass was immersing in simulated body fluid for 4 hours. SEM images reveal that the growth of apatite nanocrystals on the surface of the mesoporous bioglass can be observed.

Key words: hydroxyapatite, bioglass, sol-gel method, mesoporous material

水添加量對介孔二氧化錫合成之影響

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摘要

介孔材料由於具有高比表面積及孔洞分佈均勻之特性，其應用相當廣泛，是近年來在奈米材料科學領域中引人注目的研究領域。本研究利用三嵌段兩性共聚物作為天然模板，$SnCl_4 \cdot 5H_2O$為反應前驅物，以溶膠-凝膠法製備高比表面積的介孔二氧化錫。經 TGA, XRD, SEM, TEM和氮氣等溫吸附/脫附曲線分析材料微結構，並探討水添加量於不同煅燒溫度下之結構變化。實驗結果顯示，於煅燒溫度300~500 °C，均可合成具有cassiterite相之介孔二氧化錫。在反應系統中水的含量亦會影響二氧化錫之介孔結構。三嵌段兩性共聚物的添加量為1.0 g，以水取代酒精含量為25 %，煅燒溫度在300 °C時，可合成出比表面積約為207.99 m^2/g、孔洞直徑約為89.97 Å之介孔二氧化錫。

關鍵詞：介孔二氧化錫，溶膠-凝膠法，三嵌段兩性共聚物，比表面積

Effect of Water on the Formation of Mesoporous SnO_2

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Abstract

Recently, mesostructured materials with high surface areas and large pore sizes have attracted much attention because of their potential applications. In this study, mesoporous SnO_2 was prepared by sol-gel process and the synthesis was accomplished by using triblock copolymer as the template, and $SnCl_4 \cdot 5H_2O$ as the inorganic precursor. The effects of water additives and calcining temperatures on the structure of mesoporous SnO_2 were investigated by TGA, XRD, SEM, TEM and N_2 adsorption-desorption isotherm curve analyses. The results showed that mesoporous SnO_2 with the cassiterite structure were obtained after calcination at 300~500°C. The water content in the reaction system is believed to determine the microstructure formation. The result showed that mesoporous SnO_2 prepared with 25 % replacement of water and calcined at 300 °C exhibited a specific surface area of 207.99 m^2/g and an average pore size of 89.97 Å.

Key words: mesoporous SnO_2, sol-gel method, triblock copolymer, specific surface area

應用奈米電泳螢光粉之優化白光二極體

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摘要

本研究以電泳沉積法製作螢光粉片製備白光發光二極體，經優化電泳製程以及沉積時間後，可以有效控制奈米螢光粉末的沉積厚度與提高演色性。本研究使用ITO玻璃為基板，於20至25℃下，將奈米級YAG螢光粉末與紅色螢光粉末依比例沉積，其沉積螢光粉厚度隨時間增加而增加至到59 μm後，其厚度便隨時間增加而下降至36 μm且持續至奈米螢光粉末脫離ITO玻璃，此時因溶液中缺乏binder無法將螢光粉繼續沉積至ITO玻璃上，導致運送螢光粉之binder反而再次溶解於溶液中，所以電泳螢光粉片有厚度之限制。最後，電泳完成之螢光粉片以矽膠保護，將優化後之螢光粉片浸泡於稀鹽酸中，利用超音波震盪使螢光粉片與ITO玻璃脫離，由於酸蝕時間越長會造成紅色螢光粉薄膜被酸侵蝕而損失，進而使演色性降低，故電泳沉積時需將紅色螢光粉保護在矽膠體與YAG螢光粉末之間，本研究樣品經優化後之螢光粉薄膜搭配1瓦級藍光晶粒之封裝可得演色性達90%及光亮度15流明之白光二極體。

關鍵詞： 電泳沉積法、演色性

Application of the nanometer electrophoretic phosphor on the optimized white light-emitting diodes

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Abstract

In this study, the phosphor plate used in white LED was prepared in electrophoretic deposition method by optimizing the electrophoretic process and deposition time. The thickness of the nanometer phosphor powder plate can be well controlled and the color rendering index can be improved. Nano-YAG phosphor powder and a proportional red phosphor powder were deposited on the ITO glass substrate at the temperature range of 20~25°C. It was found that the deposition thickness of phosphor plate increased with increasing the deposition time until that the maximum thickness of 59 μm was achieved. The deposition thickness was subsequently decreased down to 36 μm and lasting to empty the plate, i.e. just only binder existed on top of the ITO. At this time, the phosphor cannot further be deposited onto the ITO due to the lack of the binder in the electrolyte, resulting in dissolving of binder. Therefore, the thickness of the phosphor plate has a maximum limit. In the final, the finish phosphor plate was covered by the silicon paste, and then with the aid of the ultrasonic machine, the sample was put into the dilute HCl solution to remove from the ITO glass. It will cause more loss of red phosphor if the processing time takes longer, such that the color rendering index would be reduced. Therefore, the red phosphor should be deposited between the YAG phosphor and the silicon paste. A one-watt class LED die was packaged with the optimized phosphor plate. A white LED with a 90% *Ra* and 15 lumen can be achieved.

Key words: electrophoretic deposition method, color rendering index.

磁性奈米光觸媒[CuZn]Fe_2O_4之製備及特性研究

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摘要

Cu-Zn ferrite是利用硝酸鐵、硝酸鎳、硝酸銅及硝酸鋅液以化學共沉法製成磁粉，再經過高溫熱處理增強其磁性。過程中設計化學合成使之避免廢料，或不產生需處理或清理的廢料；以及用對人類和環境的毒性都很低或不具毒性的溶劑、也使用同樣毒性很低或不具毒性的觸媒。於[CuZn]Fe_2O_4系統中飽和磁化量最佳條件為$Cu_{0.7}Zn_{0.3}Fe_2O_4$空氣環境下900°C燒結飽和磁化量為60.19 M(emu/g)，平均粒徑最小的為未燒結的10 nm左右，最大的為900°C的150 nm左右。以廢棄物製備[MnZn]Fe_2O_4系統中飽和磁化量最佳條件為pH = 10飽和磁化量為62.85 M(emu/g)，平均粒徑最大的為pH = 10的將近40 nm左右，從結果中可以得知，材料的晶相強度越強相對的飽和磁化量也越強但並非絕對，又材料的晶相強度越強其平均粒徑也就越大。

關鍵詞：共沉法、鐵氧磁體、飽和磁化量

The Preparation of Magnetic nano-photocatalyst and its Property

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Abstract

The magnetic Ni-Cu-Zn ferrite were produced by using ferric nitrate、and zinc nitrate via co-precipitation method. Design chemical syntheses to prevent waste, leaving no waste to treat or clean up and syntheses to use and generate substances with little or no toxicity to humans and the environment. In the [CuZn]Fe_2O_4 system, the optimum condition for saturation magnetization is $Cu_{0.7}Zn_{0.3}Fe_2O_4$, and the sintering saturation magnetization under the air environment of 900°C is 60.19 M(emu/g). The smallest average particle size of the unsintered is 10 nm, and the maximum is 150 nm when the temperature reaches 900°C. In the [MnZn]Fe_2O_4 system, which is prepared with waste, the optimum condition for saturation magnetization is pH=10 and the saturation magnetization is 62.85 M(emu/g). The largest average particle size when pH=10 is 40 nm. The results suggested that higher crystal phase strength of the material leads to stronger saturation magnetization, but not absolutely, as well as larger particle size.

Key words: co-precipitation method, ferrite, saturation magnetization

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前驅溶液硫含量對 CZTS 薄膜特性影響之研究

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摘要

銅鋅錫硫化合物(Cu_2ZnSnS_4)(CZTS)是一種重要的光電薄膜材料，其能隙值約為1.4~1.6 eV，光學吸收係數可大於10^4 cm^{-1}，並且其原料來源毒性較低，因此近幾年來引起各界廣泛的開發與研究。本論文主要以製程簡便且無需高價真空設備的濕式化學法(Wet chemistry method)製備CZTS薄膜，利用改變前驅溶液中硫源與金屬源的莫耳比例(S/Cu+Zn+Sn)，研究前驅溶液不同硫源含量對CZTS薄膜特性的影響。本研究以X-ray 繞射分析銅鋅錫硫化合物薄膜的結晶體結構，以場發射式掃瞄式電子顯微鏡(FE-SEM)分析薄膜表面形貌與斷面結構，以霍爾效應量測(Hall-effect measurement)分析薄膜電學特性，薄膜光學特性則利用紫外光/可見光/近紅外光光譜儀(UV/VIS/NIR)進行分析。實驗結果顯示本研究製備之CZTS薄膜均呈現鋅黃錫礦(Kesterit-Cu_2ZnSnS_4)結構，並且隨前驅溶液硫含量莫耳比由1.0增加至3.0，其薄膜電阻值由285.94 Ω cm下降至4.68 Ω cm，載子濃度則由 2.82×10^{15} cm^{-3}增加至5.52×10^{16} cm^{-3}，薄膜能隙值則由0.98 eV增加至1.52 eV，並且其薄膜光學吸收係數均大於10^4 cm^{-1}。

關鍵詞：銅鋅錫硫化合物，硫濃度，化學法，光電薄膜

Influences of sulfur concentration of precursor solution on the characteristics of CZTS thin films

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Abstract

Cu_2ZnSnS_4 (CZTS) is an important optoelectronic material since it has a direct band 1.4~1.6 eV and absorption coefficient over 10^4 cm^{-1} in visible light range. For the deposition of CZTS thin films, several techniques were utilized, considering for the convenience processing to synthesis CZTS films, the method of wet chemistry is very promising due to it requires relatively non-vacuum processing system. In this report, the preparation of the CZTS thin films by wet chemistry was investigated, the effect of the sulfur concentration of precursor solution on the optoelectronic properties of the CZTS films was further studied. The CZTS films were characterized by XRD,FE-SEM, UV/VIS/NIR spectroscopy and Hall-effect measurement.

Key words: Cu_2ZnSnS_4, CZTS, S concentration, wet chemistry method, optoelectronic film

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利用奈米模板製備導電高分子奈米管陣列結構

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摘要

利用多孔性陽極氧化鋁作為奈米模具，以電化學方式將導電高分子材料聚苯胺沈積至此模具的孔洞中，再蝕刻氧化鋁表面使呈現出聚苯胺奈米管(柱)陣列，作為感測器的基底。本研究以0.3莫耳濃度的草酸在60伏特的電壓下進行陽極氧化處理，製作出孔徑約130奈米及約138微米厚的微奈米圓柱模具。爾後使用氯化汞來移除陽極處理後的鋁殘留物並接著濺鍍一層導電白金層作為後續電化學沉積所需要的導電層。聚苯胺沉積後的陽極氧化鋁模仁將以1莫耳濃度的氫氧化納蝕刻，為了避免聚苯胺有團簇的情況來造成表面積降低，因此奈米管陣列的高度將被控制在150~200nm之間。此外，不同濃度的硫酸來製作聚苯胺奈米管，導電高分子聚苯胺在合成過程中會因不同的濃度而產生不同的導電度；濃度越高導電度越高。本研究以0.1至0.5莫耳濃度的硫酸進行電化學沉積再透過阻抗分析儀量測，依序以高至低的硫酸濃度排列獲得由低至高的阻抗值。最後，利用電化學合成的方式將導電高分子材料聚苯胺沉積至多孔性陽極氧化鋁模仁並透過蝕刻的控制使能簡單的就獲得較短的奈米管(柱)。

關鍵詞：陽極氧化鋁，奈米管(柱)，聚苯胺，感測器

Fabrication of conductive Polyaniline nanotube arrays using porous AAO template

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Abstract

The ordered polyaniline (PANI) nanotubes array has been electrochemically fabricated by using the anodic aluminum oxide (AAO) template for the capacitive sensors. Anodic aluminum oxide with pore diameter in 120 nm and thickness of 138 um was made in 0.3M oxalic acid at 60 volt. After mercury dichloride removed the rest aluminum part, a platinum metal layer was sputtered on the backside for the electrochemical deposition. Polyaniline (PANI) nanotube within AAO template was etched in 1M NaOH, the height of PANI nanotubes was ranged 150~200 nm and their diameter was around 110 nm in order to prevent the nanotubes clustered together. Furthermore, we also use different concentration of protonic acid (H_2SO_4) as deposition of PANI nanotubes to investigate influence on the conductivity. As the impedance measurement results, the impedance of nanotubes decreased with concentration of protonic acid, therefore, the conductivity of PANI nanotubes can vary with the concentration of protonic acid and higher concentration could result in a better conductivity of PANI nanotubes. In general, we have successfully demonstrated the fabrication of PANI nanotubes array based on electrochemical deposition in an AAO template. We believe the conductive PANI nanotubes array has great potential for novel sensor fabrication such as gas sensors, biosensors, and chemical sensors, etc.

Key words: anodic aluminum oxide, nanotube, polyaniline, sensor

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固相-液相-固相機制成長鍺奈米線之光檢測特性

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摘要

此研究主要是合成鍺奈米線並且探討其光檢測特性。我們使用鍍有金膜的氮化矽晶圓為基板，以固態—液態—固態(solid-liquid-solid, SLS)機制成功地合成出鍺奈米線(GeNW)。此製備技術既簡易又低成本，無須導入任何成長鍺氣體源(例如：GeH_4)即可在氮化矽基板上成長鍺奈米線。實驗結果顯示出，工作溫度效應對於鍺奈米線的成長相當明顯，當成長溫度為575ºC-625ºC時可以成功合成出鍺奈米線。成長溫度600ºC時，奈米線的分佈極為緻密，奈米線有較大的高寬比(aspect ratio)。試片經由EDS量測，其表面的成分組成為GeO_x ($x < 4.2$)。以氮化矽基板所成長的鍺奈米線之試片進行照光量測時，光電流值遠大於暗電流值，以電壓3 V施加於電極兩端時，光電流及暗電流分別為10.5 μA及1.7 μA，光電流值約為暗電流值的6.17倍，可得知鍺奈米線對於光有極佳的響應。

關鍵詞：固態—液態—固態機制、鍺奈米線、光檢測

The Photodetection Properties of Germanium Nanowires Grown by Solid-Liquid-Solid Mechanism

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Abstract

In this study, germanium nanowires (GeNWs) were grown directly on Au-deposited silicon nitride substrate by a solid-liquid-solid (SLS) mechanism. The microstructure of germanium nanowires are very sensitive to the growth temperature and only in a limited temperature range (575ºC-625ºC) can GeNWs having excellent morphology and high surface density be successfully grown. These long, thin, and straight GeNWs have a high aspect ratio and are surrounded by an oxide layer. The composition of corresponding oxide layers is GeO_x ($x < 4.2$). The current measurements of GeNWs under illumination were carried out at room temperature, and the photocurrent is much larger than dark current. A voltage of 3 V was applied on the electrodes, and the measured photocurrent and dark current are 10.5 μA and 1.7 μA, respectively. The photocurrent is 6.17 times to dark current. It can be found that the conductivity of GeNWs is sensitive to light illumination and thus GeNW is a promising candidate for photo-detector applications.

Key words: solid-liquid-solid (SLS), germanium nanowires (GeNWs), photodetector

P13

The Production of Carbon Nanotubes Decorated with Silver Nanoparticles for Transparent, Conductive Films Application

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Abstract

Aggregation and restacking of carbon nanotubes (CNT) can be efficiently inhibited by decorating the tube with silver nanoparticles to form CNT-silver (CNT-Ag) hybrids that can be used to form, highly transparent and electrically conductive thin films. Silver nanoparticles were modified with a $NH_2(CH_2)_2SH$ terminated by amino groups and subsequent thioester reaction with functionalized CNTs. The low sheet resistance of the resulting thin conductive film on the polyethylene terephthalate substrate was due to the increased contact areas between CNTs by grafting Ag nanoparticles on the CNTs surfaces. Increasing the contact area between CNTs improved the conductivity of the CNT-Ag thin film. The prepared CNT-Ag thin films had a sheet resistance of 118 Ω/sq with 85.6 % optical transmittance at a 550 nm wavelength. After treatment with HNO_3, a lower sheet resistance of 103 Ω/sq and a higher transmittance of 85.9 % could be attained.

Key words: carbon nanotube, transparent conductive film, electrical resistance, flexible, nano-silver

P14

Improving the electrical conductivity of carbon nanotube thin films by grafting the nanotubes with gold nanoparticles

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Abstract

Grafting carbon nanotubes (CNTs) with gold nano-particles was shown to enhance the optical quality and electrical conductivity of transparent conductive thin films. Gold nano-particles were first modified with cysteamine by amino groups; a gold nano-particle can be bound either to the alkylamine group through the lone pair of electrons on the nitrogen atom or via the amide bond. The modified gold nano-particles can then assemble on the surface of functionalized CNTs by a dehydration reaction. Using this strategy, gold nano-particles with diameter of 3 to 6 nm were assembled on the sidewalls of CNTs. A resultant CNT-Au thin film was determined to have a lower sheet resistance (46.2 2 Ω/sq), as compared to a CNT film without Au, while retaining high optical transparency (88.6% transmittance at 550 nm). The low sheet resistance of CNT-Au films was due to both an increase in the number of contact areas and a decrease in contact resistance between CNTs. The decrease in contact resistance is attributed to a 0.71 eV work function increase and a high σ_{DC}/σ_{OP} value of 152.6.

Key words: carbon nanotube, transparent conductive film, electrical resistance, flexible, nano-gold

高密度聚乙烯/奈米碳管複合材料微細發泡射出成型機械/流變/發泡性質之研究

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摘要

本研究主要探討高密度聚乙烯(High Density Polyethylene, HDPE)透過添加不同奈米碳管(CNT)含量混合成高密度聚乙烯/奈米碳管複合材料，實驗中的HDPE材料先經由馬來酸酐(MA)改質後，與奈米碳管進行混鍊，提高匹配性能，形成均勻的HDPEgMA/MWCNT奈米複合材料，再透過微細發泡射出成型以惰性氣體-氮氣(N_2)作為發泡氣體製作試片，最後經由傳統射出和微細發泡射出的拉伸和衝擊試片，來探討奈米碳管含量對機械性質/流變/發泡性質之影響。研究結果顯示出，傳統射出和微細發泡射出在機械性質方面，HDPE隨著加入奈米碳管含量的增加，在抗拉強度有上升的趨勢，而衝擊強度則呈現下降的趨勢，流變方面顯示出，在不同溫度與L/D比下添加奈米碳能增加HDPE的黏度，且在不同L/D比實驗發現，L/D比越大材料黏度越低，XRD方面顯示出，添加奈米碳管隨著含量增加其結晶性有變差的趨勢，在氣泡結構方面，得知氣泡大小會隨著奈米碳管添加的比例增加而有變小的情形，這表示可有效的提升氣泡密度。

關鍵詞：高密度聚乙烯，奈米碳管，流變，微細發泡，射出成型

The mechanical, thermal, rheological and foaming properties of HDPE/CNT nanocomposites by microcellular injection molding process

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Abstract

Organically modified carbon-nano-tube(CNT) and HDPE nanocomposites was diluted from masterbatch. The nanocomposites were then molded by conventional and microcellular injection molding process. The effects of CNT contents on the mechanical, thermal, rheological and foaming properties were investigated. The results showed that HDPE/CNT nanocomposites has better tensile strength on solid that that of foamed nanocomposites. The addition of CNT also increased the tensile strength of the nanocomposites. For the rheological test, the addition of CNT increases the viscosity of the nanocomposites. The shear-shinning effect took place when the nanocomposites sustained high shear rate. The CNT helps the nanocomposites on having small size cell on the foamed nanocomposites. The addition of CNT also improved the thermal stability of the HDPE nanocomposites.

Key words: HDPE, CNT, rheological, microcellular

混合碳纖維補強樹脂/短尺寸石墨奈米纖維對於單向碳纖維織物機械性質之研究

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摘要

本研究藉由混合碳纖維補強樹脂/短尺寸石墨奈米碳纖維複合材料來改善單向碳纖維織物之機械性質。經由拉伸測試及耐衝擊測試分析，針對短尺寸石墨奈米碳纖維添加比例對於單向碳纖維織物之機械性質之影響進行討論。從結果得知，單向碳纖維織物之拉伸強度會隨著短尺寸石墨奈米碳纖維添加量的增加而增加，拉伸強度會從1835.0 MPa 增加到2120 MPa。單向碳纖維織物之0度及90度彎曲強度會隨著短尺寸石墨奈米碳纖維添加量的增加而增加，0度彎曲強度會從1242.0 MPa增加到1339 MPa；90度彎曲強度會從67.1 MPa增加到87.7 MPa。單向碳纖維織物之剪切強度會隨著短尺寸石墨奈米碳纖維添加量的增加而增加，剪切強度會從79.0 MPa 增加到80.8 MPa。但是，單向碳纖維織物之耐衝擊強度會隨著短尺寸石墨奈米碳纖維添加量的增加而下降，耐衝擊強度會從206 kgf-cm/cm降低到130 kgf-cm/cm。從上述測試結果，我們找到一個藉由混合碳纖維補強樹脂/短尺寸石墨奈米碳纖維複合材料來有效改善單向碳纖維織物之機械性質的方法。

關鍵詞：單向碳纖維織物，碳纖維補強樹脂，短尺寸石墨奈米纖維，機械性質

Investigation on Mechanical Properties of Hybrid CFRP/SGNF Uni-directional Carbon Fiber Fabrics

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Abstract

In this study, the improvement on mechanical properties of uni-directional carbon fiber fabrics was investigated by the hybrid carbon fiber reinforced plastic (CFRP)/short graphite nano fiber (SGNF) composite. The influence of the proportions of SGNF added on the mechanical properties of uni-directional carbon fiber fabrics was discussed by analyzing of the tensile test and impact resistance test. From results, the tensile strength of uni-directional carbon fiber fabrics with increasing of SGNF content increased from 1835.0 MPa to 2120 MPa. The 0^o and 90^o flexural strengths of uni-directional carbon fiber fabrics with increasing of SGNF content increased from 1242.0 MPa to 1339 MPa and increased from 67.1 MPa to 87.7 MPa, respectively. The shear strength of uni-directional carbon fiber fabrics with increasing of SGNF content increased from 79.0 MPa to 80.8 MPa. The impact resistance of uni-directional carbon fiber fabrics with increasing of SGNF content decreased from 206 kgf-cm/cm to 130 kgf-cm/cm. From the above test results, we find an effective method to improve the mechanical properties of the uni-directional carbon fiber fabrics by adding of the hybrid CFRP/SGNF composite.

Key words: uni-directional carbon fiber fabrics, carbon fiber reinforced plastic, short graphite nano fiber, mechanical property

催化劑金屬 N_2O 氣體前處理溫度對熱化學氣相沉積奈米碳管之效應

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摘要

本研究中，在使用熱化學氣相沉積(thermal chemical vapor deposition)法來成長奈米碳管(CNT)之前，先在不同溫度下通入定量的N_2O氣體對催化劑鎳膜金屬進行前處理，以探討前處理溫度對奈米碳管成長之影響。成長過程中，甲烷氣體是主要的碳原子來源，氬氣則是作為載氣使用，高溫時甲烷被觸媒熱分解並獲得碳原子從而成長出奈米碳管。我們利用場發式電子顯微鏡(filed-emission scanning electron microscopy, FE-SEM)觀察催化劑金屬顆粒的大小及觀察碳管的表面形態及管壁結構，並使用能量質譜儀(energy dispersive spectroscopy, EDS)分析在不同溫度下的N_2O氣體前處理對奈米碳管表面結構與組成成份的改變。使用N_2O對催化劑鎳膜金屬前處理時，高溫下N_2O中的氮原子會被分解，之後再被引進催化劑鎳金屬薄膜中，而形成鎳金屬顆粒。使用N_2O氣體對催化劑鎳膜金屬前處理時所形成的鎳金屬顆粒較小且更為均勻。實驗結果發現，在925°C時使用N_2O氣體對催化劑鎳膜金屬前處理後，所成長出奈米碳管最均勻密布。

關鍵詞：奈米碳管、前處理、熱化學氣相沉積

Effect of Temperature of Catalyst Pre-Treatment Using N_2O on the Growth of Thermal Chemical Vapor Deposited Carbon Nanotubes

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Abstract

In this work, pretreatment of catalyst metal using N_2O at various elevated temperatures were carried out before the synthesis of carbon nanotubes (CNTs) by thermal chemical vapor deposition to study the effect of pre-treatment temperature on the growth of CNTs. During the growth phase, methane (CH_4) was used as the source for carbon, and argon (Ar) was used as the carrier gas. Field-emission scanning electron microscopy (FE-SEM) was used to observe the surface morphologies of catalyst droplets after pretreatment and the synthesized CNTs, and energy dispersive spectroscopy (EDS) was employed to determine the chemical composition of synthesized CNTs. During the pre-treatment process, nitrogen atoms in N_2O can be decomposed at high temperatures and are subsequently incorporated into catalyst nickel metal film to form metal droplets. With N_2O pre-treatment, the metal droplets formed are small in size and are uniformly distributed over the entire substrate. Furthermore, our experimental results reveal that using N_2O pre-treatment of catalyst metal at 925°C can induce the growth of the densest and most uniformly distributed CNTs.

Key words: carbon nanotubes (CNTs), pre-treatment, thermal chemical vapor deposition

在有機溶液加熱碳產生碳奈米粒子

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摘要

我們研究在有機溶液中加熱碳而得到碳奈米粒子。由放射光譜可以分析碳微粒在環境2600 K的高溫產生。在這劇烈的反應中，藉由掃描和透射顯微鏡得知副產物像洋蔥一樣的碳奈米粒子。反應後在有機溶液中存在球狀的碳奈米粒子。根據EDS分析，碳奈米粒子主要的元素是碳。

關鍵詞：碳奈米粒子，碳絲，場發射掃描電子顯微鏡，穿透式電子顯微鏡

The carbon nanoparticles by heating carbon in liquid

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Abstract

We investigate the carbon nanoparticles fabricated by heating carbon in liquid organic solution.The glowing light emission analysis determines the reaction surrounding at the high temperature of 2,600 K. In these violent reactions, a onion like type of carbon nanoparticles in the byproduct except the gas bubbles are determined by scanning and transmission electron microscopy. The carbon spherical nanoparticles exist after reaction in liquid organic solution.. According to the EDS analysis, carbon is the major element of nanoparticles.

Key words: carbon nanoparticles, carbon filament(CF), field emission scanning electron microscope(FESEM), transmission electron microscopy(TEM)

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自生碳化鈦對鎳基合金顯微組織及硬度之影響

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摘要

本實驗選用鎳基合金粉末，探討球磨時間(48hr.)，進而得到石墨粒徑(384nm)，以自生(in situ)方式於鎳基合金中生成碳化鈦。以真空感應熔融方式，改變石墨與鈦添加量(5~15wt%)及加熱溫度(1150~1250℃)、持溫時間(0~5min.)，探討前述條件對以自生方式形成碳化鈦之鎳基合金層顯微組織與硬度的影響。

實驗結果顯示，含碳化鈦之鎳基合金層顯微組織包含γ-Ni＋Ni_3Si、Ni_3B、Ni_3B＋Ni_3Si、$Ni_{31}Si_{12}$、Cr_3C_2、Cr_7C_3、$Cr_{23}C_6$、CrB、TiC、TiB等相。隨著石墨與鈦添加量增加、加熱溫度上升，碳化鈦生成量亦會增加。由XRD、EDS、TEM分析顯示，加熱溫度升高，會增加基地中Ni_3B+Ni_3Si的量，同時會使鉻碳化物成長。含碳化鈦之鎳基合金層硬度，會隨石墨與鈦添加量增加而上升。

關鍵詞：碳化鈦，鎳基合金

The Effects of In-Situ Titanium carbide on Microstructure and Hardness of Nickel-Based Alloy

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Abstract

In situ formation of TiC particles reinforced Ni-based alloy was prepared by vacuum induction melting in this study. The influence of particle size of graphite(384nm), additional amount of titanium and graphite powder(5~15wt%), heating temperature(1150~1250℃), and holding time(0~5min.)on the microstructure and hardness of nickel-based alloy.

Results indicated that the microstructure of nickel-based alloy, which contains titanium carbide, consists of γ-Ni+Ni_3Si, Ni_3B, Ni_3B+Ni_3Si, $Ni_{31}Si_{12}$, Cr_3C_2, Cr_7C_3, $Cr_{23}C_6$, CrB, TiC, and TiB. The amounts of titanium carbide increase with increasing the additional amounts of graphite and titanium, According to XRD, EDS, and TEM results, The amounts of Ni_3B+Ni_3Si increase with increasing heating temperature. The additional amounts of graphite and titanium increase which rise the hardness of TiC reinforced Ni-based alloy.

Key words: titanium carbide, nickel-based alloy

P20

熱處理對鎳-鈷氧化物結構及電性之影響

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摘要

本研究使用的$NiCo_2O_4$鎳鈷氧化物為一具尖晶石結構(spinel structure)之*p*型半導體材料，具有低電阻率，且可應用在透明導電氧化物(Transparent Conducting Oxide, TCO) 上。本研究利用硝酸鹽類配製鎳、鈷莫耳比為1:2之鎳鈷前驅物，以300˚C煅燒24小時後即可獲得$NiCo_2O_4$純相粉末，並觀察分別經由不同熱處理後對材料的結構之影響。由結果得知，將粉末之熱處理的溫度提高，$NiCo_2O_4$相比例逐漸減少；當熱處理溫度達到1000˚C以上，$NiCo_2O_4$相將全轉變為(Ni, Co)O岩鹽結構。本研究使用此具(Ni, Co)O岩鹽結構的靶材分別於氬氣與氧氣下進行濺鍍製程，並由X-ray繞射分析觀察到濺鍍沈積薄膜之結構皆為非晶質。將初鍍膜以氧氣氣氛進行熱處理120小時後，電阻率由$4.21 \times 10^{-1}\Omega$.cm下降至$5.41 \times 10^{-2}\ \Omega$.cm。

關鍵詞：鎳-鈷氧化物，濺鍍，熱處理

Influence of annealing temperature on the structural and optical properties of nickel-cobalt oxide

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Abstract

NiO and CoO may react and form a low-resisitivity spinel structure with P-type conducting behavior and become one of transparent conducting oxides. In this study, nickel and cobalt nitrates with adequate ratio were mixed and heated at 300˚C for 24 h. Single-phase $NiCo_2O_4$ spinel was obtained. However, when the spinel powder were heated at temperatures 500˚C, 1000˚C, and 1500˚C, (Ni, Co)O solid solution with rock-salt structure appeared with consumption of $NiCo_2O_4$ spinel. At temperatures greater than 1000˚C, most spinel phases converted into the rock-salt phases. To obtain a thin film of nickel-cobalt spinel, RF magnetron sputtering deposition method was adopted using (Ni, Co)O target under Ar or O_2 atmosphere. The as-deposited film showed amorphous structure. With annealing at 600˚C for 120 h, the resistivity decreases from $4.21 \times 10^{-1}\Omega$.cm down to $5.41 \times 10^{-2}\ \Omega$.cm was observed.

Key words: Ni-Co oxide, sputter, heat treatment

不同溫度對氧化銅薄膜光電特性之影響

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摘要

本研究主要利用溶膠-凝膠法(sol-gel)製備P型氧化銅(copper oxide,CuO)薄膜，並針對不同製程條件，探討氧化銅(CuO)薄膜之光電特性及微結構。本研究藉由改變燒結溫度得到不同氧化銅(CuO)薄膜特性，以100℃、300℃、400℃、500℃之不同燒結溫度製備氧化銅(CuO)薄膜，其在不同燒結溫度會有不同的結晶形態。對於p-type氧化銅(CuO)薄膜之特性分析，這裡藉由X光繞射分析儀(XRD)探討薄膜結晶特性、透過紫外-可見-近紅外光吸收與穿透量測儀，發現氧化銅(CuO)薄膜在可見光範圍具有高吸收光系數，再以四點探針、霍爾量測探討薄膜之載子濃度、電阻率、遷移率及量測薄膜光電特性。

關鍵詞：氧化銅、溶膠-凝膠法、熱氧化法

Effect of different temperature on the optoelectronic properties of copper oxide thin films

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Abstract

In this paper, p-type copper oxide films were deposited by sol-gel process under different post-annealing conditions. We investigated the optical properties and microstructure of copper oxide (CuO) films by changing the sintering temperature at 100 °C, 300 °C, 400 °C, 500 °C. X-ray diffraction analysis (XRD) was used to analyze the crystalline characteristic of the films. Through UV-VIS-NIR spectrophotometer, the analysis found that copper oxide films having a high coefficient of absorption of light in the visible region. The carrier concentration, resistivity and mobility of thin films were measurements by Four-point probe and Hall measurement confirms p-type copper oxide (CuO) formation.

Key words: copper oxide, sol-gel method, thermal oxidation

具有嵌入式銀奈米粒子之藍寶石圖案化基板的特性研究

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摘要

利用高溫硫酸蝕刻藍寶石後所產生的反應物[$Al(SO_4)$、$Al(SO_4)_3 \cdot 17H_2O$]做為蝕刻遮罩，再配合高溫磷酸清除遮罩層的兩段式蝕刻法，形成具有幾何孔洞之圖案化藍寶石基板，搭配射頻磁控濺鍍法濺鍍單層銀薄膜，再以高溫退火下使銀薄膜發生團聚現象形成銀奈米粒子。藉由在不同的退火溫度與時間的條件下，觀察銀奈米粒子形成型態與光特性。

關鍵詞：濕式蝕刻，射頻磁控濺鍍法，銀奈米粒子

Properties of patterned sapphire substrate embedded silver nanoparticles

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Abstract

In the beginning, sapphire was wet etching by high temperature sulfuric acid, which later produced [$Al(SO_4)$、$Al(SO_4)_3 \cdot 17H_2O$]. This reactant was used as the etching mask, which later matched the two-section wet etching method of high temperature phosphoric acid to remove the mask layer. A single-layer silver film was deposited by RF magnetron sputtering on a pattern sapphire substrate. Annealing methods were also used to make silver film aggregate and form into silver nanoparticle. Then under different annealing temperature and time conditions, surface morphology and light characteristics of silver nanoparticle were also observed.

Key words: wet etching, RF magnetron sputtering, silver nanoparticle

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以微機電製程技術翻印表面浮雕布拉格光纖光柵之研製

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摘要

本研究中會利用光學全像干涉微影(Holographic Interference Lithography)技術與黃光微影製程(Photolithography)等技術搭配製作出布拉格光柵，接著使用二甲基矽氧烷(polydimethysiloxane, PDMS)，利用烘烤後為固態之特性做出光柵模仁，並且搭配 D 型光纖(D-shaped optical fiber)結構，且利用研磨技術完成 D 型光纖結構表面研磨，並以畢氏定理和光學顯微鏡來觀測光纖研磨程度及距離核心的距離，直到接近纖蕊為止，最後以微機電製程技術翻印布拉格光柵於 D 型光纖之表面。此次實驗研製了 D 型單模光纖，並與布拉格光柵做結合，形成了表面浮雕光纖布拉格光柵(Surface Relief Fiber Bragg Gratings)，實驗中有明顯的反射頻譜，藉由初步升溫實驗中布拉格中心波長位移，可看出此原件對外在變動有極高的靈敏度。

關鍵字：光學全像干涉微影、D型光纖、表面浮雕光纖布拉格光柵

The fabrication reprint of surface relief fiber Bragg grating by using MEMS

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Abstract

In this study, a procedure, based on holographic interference lithography, photolithography and MEMS technologies, was proposed to fabricate a surface-relief fiber Bragg grating on a D-shaped optical fiber. First, a Bragg grating mold was formed on a glass substrate using the holographic interference lithography and photolithography, and after that the polymer grating structure was transferred to the surface of a D-shaped optical fiber by using the soft lithography technology.This experimental measurement was performed by a tunable laser. The reflection spectrum validate the device could be applied to temperature sensing.

Key words: holographic interference lithography, D-shaped optical fiber, surface relief fiber Bragg gratings

於多晶矽基板上製備氧化奈米多孔矽薄膜應用於太陽能電池之研究

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摘要

本論文中我們以電化學陽極化蝕刻法於多晶矽太陽電池基板上研製奈米多孔矽薄膜，同時利用掃描式電子顯微鏡(SEM)與光頻譜響應系統來觀察與分析薄膜特性與其對元件整體光響應之影響。研究中發現，所形成的多孔矽顆粒尺寸隨著蝕刻溶液濃度的提高與電流密度的降低而減小，在氫氟酸(HF)溶液濃度為45%、電流密度為10 mA/cm^{2}下所形成的多孔矽薄膜中之奈米矽顆粒大小約為12~15 nm；元件的光頻譜響應落於400~900 nm；當蝕刻電流密度降為5 mA/cm^2，所形成的多孔矽薄膜中之奈米矽顆粒大小約為8~10 nm，元件的光響應波段則落於350~900 nm；最後再經由快速熱氧化技術(RTO)於奈米多孔矽薄膜表面形成氧化奈米多孔矽，彌補奈米多孔矽的表面缺陷，降低載子表面複合機率。實驗結果顯示奈米多孔矽表面層加強了多晶矽元件對整體太陽光波段的吸收能力。

關鍵詞：多晶矽，奈米多孔矽，氧化奈米多孔矽，快速熱氧化，光伏元件

Preparation of Oxidized-Nano-Porous-Si Thin-Films on Poly-Si Substrates for Applications of Solar Cells

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Abstract

Nano-porous Si (NPS) layers were prepared on the surfaces of poly-Si substrates by using iterative diffusion process and electro-chemical anodization method. The sizes of Si crystallites in the developed NPS layers reduced with the increasing HF concentration of the etching solution and the decreasing etching current density. NPS/Poly-Si devices with smaller Si nano-crystallites got higher photo-responsivity and broader ranges of wavelength in the photo-response spectrum. Finally, we used the RTO treatments that compensated and stabilized the surface states coming from the high-density defects in the porous silicon, thus reducing the surface carrier recombination rate. Experimental results showed the NPS surfaces enhanced the solar light absorption efficiency of poly-Si devices.

Key words: poly-Si, nano-porous-silicon, oxidized-NPS, RTO, photo device

氧化鋅摻鋁之奈米柱特性研究

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摘要

在本研究中，是用水熱法來成長氧化鋅摻鋁之奈米柱，首先利用濃度0.0075 M的醋酸鋅(Zinc acetate)旋轉塗佈在二氧化矽/矽基板上做不同次數的前處理(6~12次)。再以硝酸鋅(Zinc nitrate)與硝酸鋁(Aluminium nitrate)以及環六亞甲基四胺(Hexamethylenetetramine)，以鋁摻雜只有佔2%的比例分別加入去離子水中，進而調配成0.06M硝酸鋅、0.0012M硝酸鋁以及0.06M環六亞甲基四胺之成長反應溶液。然後將前處理6~12次於二氧化矽/矽(SiO_2/Si) 基板分別置入在成長反應溶液中，於90^{o}C下成長4小時。藉由場發射電子顯微鏡(FE-SEM)觀察奈米柱成長的尺寸大小與表面形貌，然後利用半導體參數分析儀(Keithley 4200)測量不同前處理次數的電流電壓特性曲線及酸鹼感測趨勢。實驗結果發現，前處理12次時可獲得更小尺寸的AZO奈米柱徑，而在pH7~11緩衝溶液中的酸鹼感測反應趨勢發現其電流感測度約為24.02 μA/pH。

關鍵詞：水熱法、氧化鋅摻雜鋁、奈米柱、場發射電子顯微鏡、酸鹼感測

Characteristics of Aluminum-Doped Zinc Oxide Nanorods

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Abstract

In this study, the growth of aluminum-doped zinc oxide nanorods by hydrothermal method. First, the pre-treatment procedures were included the 0.0075 M zinc acetate solution was spin-coated on SiO_2/Si substrates for different number of times(6 to 12 times). Secondary, the SiO_2/Si substrate was submerged horizontally in 0.06M mixture solution of zinc nitrate hexahydrate ($Zn(NO_3)_2 \cdot 6H_2O$), diethylenetriamine (DETA), and doped the solution of aluminium nitrate, nonahydrate ($Al(NO_3)_3 \cdot 9H_2O$) at about 90 ^{o}C for 4h. The size and surface morphology of the Al-doped ZnO nanorods were examined by a field emission scanning electron microscope (FE-SEM), and the current-voltage(*I-V*) characteristics curves and pH sensing response were measured by the semiconductor parameter analyzer (Keithley 4200). The experimental results found that the smaller diameter of AZO nanorods can be obtained at 12 times pre-treatment. In addition, the superior pH sensing response in pH 7~11 buffer solutions, and the current of pH sensitivity is 24.02 μA/pH.

Key words: hydrothermal method, Al-doped ZnO, nanorods, FE-SEM, pH sensing

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以水溶液法製備之摻雜鋁氧化鋅奈米柱

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摘要

本研究使用水溶液法在P型矽基板上製備摻雜鋁氧化鋅(aluminum-doped zinc oxide, Al-doped ZnO)奈米柱並量測不同摻雜濃度之摻雜鋁氧化鋅之表面型態、結構成分與導電性。實驗中，先以無水酒精(ethyl alcohol, C_2H_5OH) 加入醋酸亞鋅(zinc acetate, $Zn(CH_3COO)_2 \cdot 2H_2O$)調製成0.0075 M之溶液，以旋轉塗佈(spin coating)方式於*p*型矽基板製備種子層(seeding layer)。之後，再以體積濃度0.02 M的四氮六甲圜(hexamethylenetetramine, $C_6H_{12}N_4$)、0.02 M的硝酸鋅(zinc nitrate hexahydrate, $Zn(NO_3)_2 \cdot 6H_2O$)及不同濃度硝酸鋁(aluminum nitrate, $Al(NO_3)_3 \cdot 9H_2O$)調製成混和溶液，加熱至90˚C並維持兩小時以成長氧化鋅奈米柱。由場發式電子顯微鏡(field-emission scanning electron microscopy, FE-SEM)觀測到氧化鋅為六角柱狀，並且由能量質譜儀(energy diffraction spectroscopy, EDS)分析得知摻雜鋁氧化鋅奈米柱是由鋅、氧及鋁所組成。由霍爾效應(Hall effect)量測證實摻雜鋁氧化鋅奈米柱的確具有*n*型導電性。而由不同摻雜濃度硝酸鋁所製備的摻雜鋁氧化鋅奈米柱也會展現不同之*I-V*特性。另外，實驗也發現摻雜鋁氧化鋅奈米柱之光激發螢光(photoluminescence, PL)峰值大約在378 nm至380 nm之間。

關鍵詞：摻雜鋁氧化鋅、霍爾效應量測、光激發螢光

Aluminum-Doped Zinc Oxide Nanorods Prepared by Solution Growth Method

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Abstract

In this study, aluminum-doped zinc oxide (Al-doped ZnO) nanorods which were prepared by solution growth method on p-type silicon substrate were fully characterized. First, ethyl alcohol (C_2H_5OH) was added to zinc acetate ($Zn(CH_3COO)_2 \cdot 2H_2O$) to form a 0.0075 M mixed solution. This mixed solution was then used to form a seeding layer on silicon substrate by spin coating. Subsequently, mixed solutions using 0.02M hexamethylenetetramine ($C_6H_{12}N_4$), 0.02 M zinc nitrate hexahydrate ($Zn(NO_3)_2 \cdot 6H_2O$), and aluminum nitrate ($Al(NO_3)_3 \cdot 9H_2O$) of various concentrations were prepared. And the growth was carried out in the mixed solution at 90˚C for two hours. As observed from field-emission scanning electron microscope (FE-SEM), the synthesized ZnO are hexagonal nanorods indeed. The chemical components of Al-doped ZnO nanorods were determined from energy diffraction spectroscopy (EDS) and are zinc, oxygen, and aluminum. The conductivity type for Al-doped ZnO nanorods is n-type indeed as was determined from Hall effect measurement. As expected, the Al-doped ZnO nanorods prepared by aluminum nitrate of different concentrations also exhibit different *I-V* characteristics. In addition, the photoluminescence (PL) characteristic peak is in the range between 378 nm and 380 nm for Al-doped ZnO nanorods.

Key words: aluminum-doped zinc oxide (Al-doped ZnO), Hall effect measurement, photoluminescence (PL)

水溶液成長法成長摻雜鋁氧化鋅及摻雜銀氧化鋅奈米柱之特性

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摘要

本研究中，摻雜鋁氧化鋅(aluminum-doped zinc oxide, Al/ZnO)奈米柱與摻雜銀氧化鋅(silver-doped zinc oxide, Ag/ZnO)奈米柱分別是使用硝酸鋅六水合物(zinc nitrate hexahydrate, $Zn(NO_3)_2{\cdot}6H_2O$)、四氮六甲圜(hexamethylenetetramine, $C_6H_{12}N_4$)與硝酸鋁(aluminum nitrate, $Al(NO_3)_3{\cdot}9H_2O$)或硝酸銀(silver nitrate, $AgNO_3$)在矽基板上以90°C溫度成長兩個小時。硝酸鋅六水合物和四氮六甲圜的濃度為1:1。硝酸鋅六水合物的體積濃度為0.02 M，四氮六甲圜的體積濃度為0.02 M。摻雜物的體積濃度皆為0.0004 M。濃度皆為硝酸鋅六水合物的2%。由能量質譜儀(energy dispersive spectroscopy, EDS)觀察得知，摻雜後的奈米柱皆有微量的摻雜元素。觀察場發射穿透式電子顯微鏡(field emission tunneling electron microscopy, FE-TEM)的繞射圖譜，並對照晶體結構資料庫(1997 JCPDS-ICDD:36-1451)得知，奈米柱結構為單晶的纖鋅礦結構。實驗結果發現，使用傅立葉轉換紅外線光譜儀(Fourier transform infrared spectroscopy, FT-IR)可得知鋁摻雜氧化鋅奈米柱在1735.8 cm^{-1}附近有一強烈的吸收峰。而摻雜銀氧化鋅與無摻雜的氧化鋅比較發現，摻雜銀後之光譜在926.4 cm^{-1}、1415.7 cm^{-1}、1563.7 cm^{-1}處有不同的吸收峰。

關鍵詞：Al/ZnO、Ag/ZnO、奈米柱結構、吸收峰

Nanostructures of aluminum-doped zinc oxide (Al/ZnO) and silver-doped zinc oxide (Ag/ZnO) prepared by solution growth method

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Abstract

In this study, aluminum-doped zinc oxide (Al/ZnO) and silver-doped zinc oxide (Ag/ZnO) nanorods were grown on silicon substrates by heating the mixed solution of zinc nitrate hexahydrate ($Zn(NO_3)_2{\cdot}6H_2O$), hexamethylenetetramine ($C_6H_{12}N_4$), and aluminum nitrate ($Al(NO_3)_3{\cdot}9H_2O$) or silver nitrate ($AgNO_3$) at 90°C for 2 hours. The ratio of volume concentration of zinc nitrate hexahydrate (0.02 M) to hexamethylenetetramine (0.02M) is 1:1. The purpose of aluminum nitrate and silver nitrate was to supply dopant atoms and had the same volume concentration (0.0004 M) which is only 2% that of zinc nitrate hexahydrate or hexamethylenetetramine. Observed from energy dispersive spectroscopy (EDS) results, dopant (Al and Ag) atoms have been successfully introduced into zinc oxide (ZnO) nanorods. Based on the observation of diffraction patterns obtained from field emission tunneling electron microscopy (FE-TEM) and consultation with Crystal Structure Database (1997 JCPDS-ICDD:36-1451), both Al/ZnO and Ag/ZnO nanorods are of single-crystalline Wurtzite structure. An absorption peak located at 1735.8 cm^{-1} in the spectrum obtained by Fourier transform infrared spectroscopy (FT-IR) can be clearly observed for Al/ZnO nanorods. In direct contrast with undoped ZnO, several absorption peaks located at 926.4 cm^{-1}, 1415.7 cm^{-1}, and 1563.7 cm^{-1} can be clearly seen for Ag/ZnO nanorods.

Key words: aluminum-doped zinc oxide (Al/ZnO), silver-doped zinc oxide (Ag/ZnO)

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以溶膠—凝膠法所成長摻雜銀氧化鋅奈米柱之特性

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摘要

本研究量測以溶膠—凝膠法所製備之摻雜銀氧化鋅(argentum-doped zinc oxide)奈米柱之特性。在製備過程中，首先使用甲醇(methanol, CH_3OH)加入醋酸亞鋅(zinc acetate, $Zn(CH_3COO)_2 \cdot 2H_2O$)與單乙醇胺(ethanolamine, NH_2CH_2OH)所調製成之溶液，以旋轉塗佈(spin coating)方式於*n*型矽基板上製備種子層(seeding layer)。之後，調製體積濃度為0.02 M的四氮六甲圜(hexamethylenetetramine, $C_6H_{12}N_4$)、體積濃度0.02 M的硝酸鋅(zinc nitrate hexahydrate, $Zn(NO_3)_2 \cdot 6H_2O$)及不同濃度硝酸銀(silver nitrate, $AgNO_3$)之混和溶液，然後在90˚C溫度下成長兩小時。由場發式電子顯微鏡(filed-emission scanning electron microscope, FE-SEM)可觀測到所成長的氧化鋅為六角柱狀，而由能量質譜儀(energy dispersive spectroscopy, EDS)可分析此奈米柱的確是由鋅、氧及銀所組成。由霍爾效應(Hall effect)量測證實所成長的氧化鋅奈米柱為*p*型，而光激發螢光(photoluminescence, PL)峰值大約在380.4 nm至381.1 nm之間。由電性*I-V*量測可得知不同摻雜濃度所成長摻雜銀氧化鋅奈米柱會展現不同的*I-V*特性曲線圖。

關鍵詞：氧化鋅奈米柱、摻雜銀、霍爾效應量測、光激發螢光(PL)量測

The Properties of Argentum-Doped Zinc Oxide Nanorods Prepared by Sol-Gel Process

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Abstract

In this study, argentum-doped zinc oxide (Ag-doped ZnO) nanorods which were prepared by a sol-gel process on n-type silicon substrate were fully characterized. First, ethyl alcohol (C_2H_5OH) was added to zinc acetate ($Zn(CH_3COO)_2 \cdot 2H_2O$) to form a mixed solution. This mixed solution was then used to form a seeding layer on silicon substrate by spin coating. Subsequently, mixed solutions using 0.02 M hexamethylenetetramine ($C_6H_{12}N_4$), 0.02 M zinc nitrate hexahydrate ($Zn(NO_3)_2 \cdot 6H_2O$), and silver nitrate ($AgNO_3$) of various concentrations were prepared. And the growth was carried out in the mixed solution at 90˚C for two hours. As observed from field-emission scanning electron microscope (FE-SEM), the synthesized ZnO are hexagonal nanorods indeed. The chemical components of Ag-doped ZnO nanorods were determined from energy dispersive spectroscopy (EDS) and are zinc, oxygen, and aluminum. The conductivity type for Ag-doped ZnO nanorods is n-type indeed as was determined from Hall effect measurement. As expected, the Ag-doped ZnO nanorods prepared by silver nitrate of different concentrations also exhibit different *I-V* characteristics. In addition, the photoluminescence (PL) characteristic peak is in the range between 380.4 nm and 381.1 nm for Ag-doped ZnO nanorods.

Key words: argentum-doped zinc oxide (Ag-doped ZnO), Hall effect measurement, photoluminescence (PL)

利用銀擴散摻雜法製備 *p* 型 ZnO 薄膜之研究

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摘要

本實驗裡我們利用常壓式金屬有機化學氣相沉積(AP-MOCVD)製作摻雜銀之*p*型氧化鋅(ZnO)薄膜，我們以二乙基鋅及水分別做為Zn與O元素的材料來源，銀為*p*型摻雜源。本研究中使用電子槍蒸鍍10 nm銀在矽(100)基板上後，成長多晶氧化鋅底膜，藉著適當的回火溫度550°C使銀向上擴散至後續所成長的氧化鋅中，並讓銀原子取代鋅原子，達成*p*型摻雜。於此論文中我們針三種不同條件下的樣品做分析:未摻雜、未回火及回火的氧化鋅薄膜特性進行分析比較，首先X光繞射(XRD)分析光譜之主峰顯示六角纖鋅礦結構(wurtzite structure)，於(002)晶面有明顯地從優取向趨勢；霍爾量測電洞濃度可達10^{21} cm^{-3}、遷移率2.47 $cm^2/V{\cdot}s$以及電阻率2.27×10^{-3} Ω·cm，並且由所製備的p型氧化鋅於低溫4.8 K下所量測的光激螢光(PL)光譜中顯示出在3.03 eV有明顯的來自自由電子與受體雜質所束縛的電洞之復合(FA)發光，此結果更進一步驗證了利用銀擴散摻雜技術成功地製備了*p*型ZnO薄膜。

關鍵詞：*p*型氧化鋅，銀摻雜，霍爾量測，光激發螢光

Characterization of p-type ZnO doped by silver film diffusion

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Abstract

Ag-doped ZnO(ZnO:Ag) thin film have been fabricated by atmospheric pressure metal-organic chemical vapor deposition(AP-MOCVD). Diethylizinc (DEZn) and water vapor were used as the precursors of Zn and O, and Ag was as *p*-type doping source. In this study, the 10nm Ag film were evaporated on Si(100) substract by Electron Beam Evaporation. After that , ZnO thin film were grown on Ag film and then annealing in O_2 ambient with temperature 550°C. For p-doped ZnO, the Ag film(atom) were diffused by annealing and substituted for Zn(Ag_{Zn}). In this paper , ZnO:Ag thin film were investigate at three different sample, there were pure, no anneal, and anneal respectively. XRD shows that ZnO:Ag thin film are polycrystalline with a wurtzite crystal structure having(002) preferred orientation. ZnO:Ag thin film shows p-type conductivity with hole concentration of 10^{21} cm^{-3} by Hall measurement, mobility of 2.47 $cm^2/V{\cdot}s$. 4.8K photoluminescence(PL) spectra indicates obvious peak 3.03 eV is indicated the FA emission caused by the recombination of the free electron.

Key words: *p*-type ZnO, Ag doped, Hall measurement, photoluminescence

利用常壓式金屬有機化學氣相沉積製作砷摻雜正型氧化鋅薄膜

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摘要

本實驗運用常壓式金屬有機化學氣相沉積法(AP-MOCVD)在矽(100)基板上成長摻雜砷之正型氧化鋅(ZnO)薄膜，我們以二乙基鋅以及去離子水作為鋅及氧之材料來源，砷為摻雜源。本研究在矽(100)基板上沉積氧化鋅，藉由在氧氣中利用回火溫度450℃使砷原子取代鋅原子並與兩個鋅空缺鍵結(As_{Zn}-$2V_{Zn}$)，達成正型(*p*-type)摻雜。本實驗中我們針對在回火溫度450°C之砷摻雜氧化鋅薄膜進行光性、電性及結構做分析比較。於X光繞射(XRD)分析光譜得知氧化鋅薄膜之主峰顯示六角纖鋅礦結構(wurtzite structure)，晶向在(002)面有從優取向趨勢；利用霍爾量測得知其載子濃度達4.9×10^{17} cm^{-3}、遷移率32.1 $cm^2/V\cdot s$及電阻率0.4 Ω·cm，此外在光機螢光(PL)低溫4.8 K下量測到3.359 eV為束縛於中性受體原子激子複合(A^0X)發光及量測到3.32 eV有自由電子與受體雜子所束縛的電動複合(FA)發光，進一步驗證了利用砷摻雜與熱回火技術成功製備正型氧化鋅薄膜。研究結果顯示，利用適當溫度450°C回火可讓本質為*n*-type之氧化鋅薄膜，轉變成*p*-type氧化鋅薄膜。

關鍵詞：*p*型氧化鋅，砷摻雜，霍爾量測，光激螢光

Arsenic-Doped ZnO thin films by atmospheric pressure metal organic chemical vapor deposition

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Abstract

In this study, Zinc Oxide was grown on Si(100) substrate using Arsine(AsH_3) Oxygen (di-ionized water) and Znic (DEZn) as precursor by atmospheric pressure metal organic chemical vapor deposition (AP-MOCVD).In this study, we annealing ambient into O_2 and As environment with 450°C,this should help to create As substitution for Zn and As combined with two Zn vacancies(As_{Zn}-$2V_{Zn}$). X-Ray Diffraction(XRD) measurements show the that one peak corresponding to ZnO (002) is observed, which indicates highly c-axis oriented ZnO:As film and wurtzite structure., Photoluminescence(PL) measurements show the peaks located at 3.359 eV as arising from acceptor-bound exaction emission(A^0X), 3.32 eV as recombination emission between free electrons and acceptor holes(FA).Hall measurements show *p*-type hole concentration of 4.9×10^{17} cm^{-3} ,Hall mobility of 32.1 $cm^2/V\cdot s$ and resistivity of 0.4 Ω·cm. The research show that the the annealing with temperature 450 °C the nature of the n-type zinc oxide films into p-type zinc oxide film.

Key words: *p*-type ZnO, Hall measurements, PL measurements

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常壓化學氣相沉積氧化鋅奈米線製作染料敏化太陽能電池之研究

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A Study on the preparation of dye synthesized solar cells using APCVD zinc oxide nano columns

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Abstract

From the aspect to scale up the preparation of nano materials, atmospheric chemical vapor deposition (APCVD) owns the advantages of high throughput, simple and reliable system, and lower deposition temperature. In this study, we attempt to explore the APCVD process to grow ZnO nanowires, which were then being used as the electrodes for dye synthesized solar cell (DSSC). This horizontal APCVD used zinc acetylacetonate as precursor, copper net as substrate, with deposition temperature from 300 to 400^{o}C. SEM found out that these nanowires are thin, with smooth surface, and have diameters from 100 to 250 nm, and lengths from 2 to 6.67 μm. SEM images show that these nano materials have an axial growth rate as fast as 60 nm/min. This is attributed to the metal catalysis vapor-liquid-solid (VLS) mechanism, initiated by the metal eutectic droplets on the surface in the initial stage of deposition, as predicted by related phase diagrams.

The best nanowires was grown in an APCVD at 350^{o}C. DSSC using such nanowires have a output voltage of 0.63 V, and a current density of 0.34 mA/cm^{2}. The deposition temperature is crucial. When the deposition temperature rose from 300 to 400^{o}C, both output voltage, and current density change significantly.

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低壓化學氣相沉積氧化鋅奈米線製作染料敏化太陽能電池之研究

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A Study on the making of dye synthesized solar cells using LPCVD grown zinc oxide nanowires

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Abstract

Recently, due to economical reasons, numerous zinc oxide (ZnO) nano structured have been studied by global research community. In this study, to acquire the feasibility for using ZnO nanowires as the electrodes for dye synthesized solar cell (DSSC), we used zinc acetylacetonate and iron acetylacetonate as precursor, and performed deposition at 600^{o}C, in a hot wall, horizontal low pressure chemical vapor deposition system, to prepare zinc/iron oxdes. On the surface of copper net, large area, high density, with remarkable alignment arrays of nanowires were deposited. XRD patterns confirms that these nanolines were made of ZnO(002) and α phase Fe_2O_3. According to related studies, in situ doping during vapor phase growth seems to be an indispensable method to generate novel nanotructure. SEM results indicate that the growth was identified as the vapor-liquid-solid (VLS) mechanism, and the metal droplets reduced from substrate served as the catalyst for the growth of the ZnO nanowires. XRD confirm that the product phases and morphologies are strongly dependent on the temperature, pressure, and substrate being used. Some iron doped ZnO nanowires have a diameter of 50 nm, and a length of 8 μm.

The experimental data show that the amount of $Fe(acac)_3$ (1-10 wt%) introduced had a significant impact on the geometric parameters of nanowires, and the performance of the cell. The best nanowires was grown in a LPCVD process using 0.1 g of $Fe(acac)_3$, mixed with 1 g of $Zn(acac)_2$. DSSC using such nanowires have a output voltage of 0.765 V, and a current density of 0.5 mA/cm^2. The deposition temperature for LPCVD to fabricate nanowire is also important. When the deposition temperature rose from 500 to 600^{o}C, both output voltage, and current density increase significantly. This study show that, the LPCVD grown Fe:ZnO nanowires can be successfully applied to the assemble of DSSC, with high reliability.

Key words: low pressure chemical vapor deposition, ZnO, nanowires, dye synthesized solar cell

於氧化奈米多孔矽基板上沉積氧化鋅薄膜應用於紫外光檢測器

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摘要

本文研究於氧化奈米多孔矽層上沉積氧化鋅薄膜，並以其製造氧化鋅紫外光檢測器，氧化奈米多孔矽層是在矽積板上以電化學陽極蝕刻並經由快速熱氧化所製作而成。實驗結果顯示，製作於氧化奈米多孔矽基板上之氧化鋅檢測器對於300 nm到400 nm波長的入射光有非常高的響應度，在入射光波長為375 nm下，紫外光感測元件具有很大的光/暗電流比，約可達104，顯示此元件對於紫外光具有靈敏度。實驗結果證明此元件於低成本之紫外光感測的應用上具有很大潛力。

關鍵詞：奈米多孔矽、氧化鋅、紫外光、檢測器

Deposition of ZnO Thin-Films on Oxidized Nano-Porous-Silicon Substrates for Ultra-Violet Sensing Applications

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Abstract

This paper reported the deposition ZnO thin-films and the fabrication of ZnO ultra-violet (UV) sensing devices on oxidized nano-porous-Si (ONPS) layers. The ONPS layers were prepared on Si substrates by electro-chemical anodization technique and rapid-thermal oxidation process. Experimental results showed that the developed ZnO-on-ONPS devices demonstrated high photo-responsivity for 300~400 nm incident UV light and got a large photo-to-dark current ratio up to 104 at an incident wavelength of 375 nm, indicating their high potential for development of low-cost UV photodetectors.

Key words: ZnO, nano-porous-Si, sensing

研究氧化鋅薄膜的缺陷中心從光電導性和熱激發電流測量

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摘要

我們研究氧化鋅的光電導和熱激發電流的效應，此樣品是由先驅物乙酰丙酮鋅和氧氣，通過低壓化學氣相沉積法生長的氧化鋅薄膜。在康寧玻璃基板上成長薄膜，機版的溫度在300°C和400°C之間。由X射線衍射分析表明，氧化鋅薄膜在生長溫度350°C具有良好的結構。在SEM測量確定氧化鋅薄膜的厚度為約50 nm。熱激發電流的測量中有一個約50 K的峰值，此特性溫度顯示出屬於氧化鋅薄膜中的能陷中心。

關鍵詞：氧化鋅薄膜，光電，半導體，熱激發電流

The defect centers of ZnO thin films studied from PC and TSC measurements

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Abstract

We investigate the photoconductivity and thermally stimulated current of ZnO thin films grown by low pressure CVD by the precursor of Zinc acetylacetonate and oxygen. The thin films were deposited on Corning glass substrates at substrate temperatures between 300 and 400 °C. The XRD analysis shows that the ZnO thin film has a good structure at growth temperature 350°C. The SEM measurement determines that the thickness of ZnO thin films is about 50 nm. In the thermally stimulated current measurement, there is main feature temperature at about 50 K, it is suggested that the feature energy belongs to the defect centers of ZnO thin films in this growth method system.

Key words: ZnO, photoconductivity, thin film semiconductor, thermal stimulated current

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低溫成長氧化鋅薄膜於不同基板上之電性研究

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摘要

本實驗中採用磁控射頻濺鍍法沉積氧化鋅磊晶薄膜在矽、聚亞醯胺、玻璃等基板上。實驗中將氬氣分壓固定在 40 mTorr，射頻輸出功率為 100 W，分別固定在常溫及 200 °C 下磊晶成長，透過 X 光繞射分析儀掃描發現樣品在 200 °C 時氧化鋅薄膜成長較佳。在低溫電阻量測系統及霍爾量測系統下量測薄膜之電阻率、載子濃度及載子遷移率等特性，探討在不同基板上成長薄膜所呈現的性質。研究中發現在常溫及 200 °C 下成長於矽、聚亞醯胺、玻璃基板上電阻均具有半導體傳輸特性。

關鍵詞：低溫電阻量測系統、霍爾量測、電阻率、載子濃度、載子遷移率

Characteristics of low-temperature ZnO films on various substrates

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Abstract

In this study, ZnO thin films on Si, Polyimide (made by MGC), and glass substrates were fabricated by the rf magnetron sputtering system. The films were deposited at 40 mTorr Argon pressure with rf power outputted at 100 W, and the substrate temperature were ambient or hold at 200 °C. The X-ray diffraction results show that the samples grown at 200 °C are better at crystallinity than the ones grown at ambient temperature. To characterize the deposited thin films, resistivity, carrier concentration, and carrier mobility were measured by the low temperature resistance measurement system and the Hall effect measurement system. The results indicated that all of the ZnO films, including deposited on Si, Polyimide, and glass substrates, either under ambient temperature or 200 °C, possessed semiconductor transport properties.

Key words: RT system, Hall effect measurement systems, resistivity, carrier concentration, carrier mobility

低溫成長氧化鋅在矽及玻璃基板上之光致螢光量測研究

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摘要

本實驗中採用磁控射頻濺鍍法磊晶成長氧化鋅薄膜在矽及玻璃基板上。薄膜成長條件為在 40 mTorr 氬氣工作氣體下，以射頻功率 100 W 濺射一 2 英吋氧化鋅靶，改變不同薄膜成長溫度(常溫、200°C)進行氧化鋅薄膜成長。搭配 X 光繞射儀量測量氧化鋅結晶特性及磊晶方向，並透過場發式掃描顯微鏡觀察以了解不同成長條件對氧化鋅薄膜表面形貌之影響。利用光致螢光系統(photoluminescence，PL)量測，以分析探討以不同溫度分別成長在不同基板下的氧化鋅薄膜之能隙變化。

關鍵詞：氧化鋅薄膜、能隙、光致螢光

Study of photoluminescence spectra of the low-temperature growth ZnO thin films on Si and glass substrates

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Abstract

The epitaxial growth ZnO films were deposited on Si and glass substrates by rf magnetron sputtering with substrate temperature below 200 °C. The growth of the thin films was performed at a pressure of 40 mTorr Ar with a sputtering power of 100 W. The crystallinity and crystal direction of the ZnO films was investigated by the X-ray diffractometry. Scanning electron microscopy (SEM) was utilized to study the surface morphology of the ZnO films. The photoluminescence (PL) spectra of the deposited films were measured to analyze the band gaps. In this paper, the gap states of the ZnO films grown on different temperature were explored.

Key words: ZnO thin film, bandgap, photoluminescence, PL

分子篩膜最佳製備參數與其對二氧化碳吸附之性能研究

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摘要

本研究使用吸附技術對於二氧化碳(CO_2)在填充床吸附系統中進行吸附性能測試，亦由微量天平得到等溫吸附曲線以分析吸附劑與吸附質間之質傳現象，此過程僅需少量吸附劑即可完成，此法不僅可有效分析吸附技術對CO_2 之移除效果，亦可達省時、省能之要求，可謂兼具環保與節能之綠色科技。本研究對於CO_2吸附方面則使用活性碳、矽膠、分子篩等吸附劑於固定床吸附塔中進行CO_2之吸附性能測試，至於等溫吸附曲線之建立將有助於相關研究對於填充床吸附塔之規劃設計。分子篩對於CO_2有良好之吸附效果，由於不同製備參數所得之分子篩將有不同的表面性質，因此研究中亦自行合成分子篩粒子與分子篩膜，進而探討製備參數對於分子篩吸附CO_2性能之影響。分子篩膜為近十多年來發展出之無機膜，除了具備一般無機膜良好的耐高溫、抗化學侵蝕與生物侵蝕、機械強度高、通量大等特性外，分子篩性質亦屬易調變性，即矽鋁原子不但可由其他原子取代，亦可調整矽/鋁比而達到使用者之需求。除二氧化碳外，工廠或發電廠所釋放出的物質亦包含其他氣體，為充分探討其他氣體對吸附二氧化碳性能之影響，研究中亦考量競爭吸附，探討吸附劑吸附兩種吸附質之質傳現象。

關鍵詞：吸附劑、分子篩、二氧化碳、填充床吸附塔、競爭吸附

Studies of the Optimum Parameters for Synthesizing Molecular Sieve Membrane and the Adsorption Performance for CO_2

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Abstract

The adsorption will be adopted to test the adsorption performance of Carbon dioxide (CO_2) in the packed-adsorber system in this study. Besides, the apparatus of microbalance will also be used to obtain the adsorption isotherm and analyze the mass transfer phenomena between adsorbent and adsorbate. The fewer adsorbate will be needed in the microbalance. Therefore, using microbalance could not only analyze the performance of removal of CO_2, but also attain the purpose of saving time and energy. This method, which combines environmental protection and energy saving, can be consistent with green science and technology. Activated carbon, silica gel, and molecular sieve will be packed into the packed-adsorber system to study the performance of removal of CO_2. The adsorption isotherm will also be established, and it will take advantage of designing the adsorber in future. The cited literatures[1~4] reported that the adsorption performance was good for removing CO_2 by molecular sieve, and the surface characteristics were different under the changeable preparing parameters. Mentioned above, the molecular sieve particle and membrane will be prepared to discuss the effect of preparing parameters on the surface characteristics and adsorption performance of CO_2. The molecular sieve membrane was the inorganic membrane, and was developed in recent years. In addition to the properties of high-temperature stability, anti chemical corrosion and bio-corrosion, the higher mechanical strength, and the higher fluid flux, the ratio of Si/Al could be adjusted and replaced to improve the properties of molecular sieve. Since the emitted discharge also included CO_2 and other gases in the power plant, some other gases will also be selected to feed the adsorption system to discuss the phenomena of competitive adsorption between adsorbent and adsorbates.

Key words: adsorbent, molecular sieve, carbon dioxide, packed adsorber, competitive adsorption.

以鈮酸鈉鉀-鈦酸鉍鈉鉀陶瓷變化組成及燒結條件其壓電及介電性質之探討

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摘要

以鈮酸鈉鉀為主體的壓電陶瓷，目前已成為無鉛系列中的主流之一，本文將使用氧化物固態混合法合成鈮酸鈉鉀-鈦酸鉍鈉鉀之無鉛壓電陶瓷，其化學式為$(1-x)(Na_{0.5}K_{0.5})NbO_3$-$xBi_{0.5}(Na_{0.75}K_{0.25})_{0.5}TiO_3$的固溶系統，其$x$分別為0.01、0.02、0.03、0.04、0.05，製程燒結條件為1100℃其時間變化為3 hrs、5 hrs、7 hrs，分析其壓電性質以及介電性質。由 XRD 特性分析結果顯示，其結構為斜方晶相。而 $0.97(Na_{0.5}K_{0.5})NbO_3$ -$0.03Bi_{0.5}(Na_{0.75}K_{0.25})_{0.5}TiO_3$系統發現，燒結持溫5 hrs其電特性皆優於其他組成與燒結時間，介電常數、平面頻率常數、平面機電耦合因素、壓電常數分別為903、2846、0.469、192。

關鍵詞：鈮酸鈉鉀、鈦酸鉍鈉鉀、燒結、壓電性質、介電性質。

The Effect of Compositions and Sintering Time on Piezoelectric and Dielectric Properties of $(Na_{0.5}K_{0.5})NbO_3$-$Bi_{0.5}(Na_{0.75}K_{0.25})_{0.5}TiO_3$

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Abstract

In this work, the piezoelectric ceramic system of the $(1-x)(Na_{0.5}K_{0.5})NbO_3$ -$xBi_{0.5}(Na_{0.75}K_{0.25})_{0.5}TiO_3$ is studied. The effect of compositions and sintering time on the properties of $(Na_{0.5}K_{0.5})NbO_3$-$Bi_{0.5}(Na_{0.75}K_{0.25})_{0.5}TiO_3$ [NKN-BNKT] ceramic is discussed. To study the influence of compositions and sintering time, the compositions in the range from 0.01 to 0.05 and the sintering time in the range from 3 hrs to 7 hrs at 1100℃. Only an orthorhombic phase with a perovskite structure was observed. Dielectric and piezoelectric properties $0.97(Na_{0.5}K_{0.5})NbO_3$-$0.03Bi_{0.5}(Na_{0.75}K_{0.25})_{0.5}TiO_3$ have maximum values at the sintering time of 5 hrs. The ε_r、k_p 、N_p and d_{33} are 903、2846、0.469、192, respectively.

Key words: $(Na_{0.5}K_{0.5})NbO_3$, $Bi_{0.5}(Na_{0.75}K_{0.25})_{0.5}TiO_3$, sintering, piezoelectric property, dielectric property.

「鈮酸鈉鉀-鈦酸鉍鈉鉀」變化極化溫度其電特性之探討

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摘要

本文之研究使用氧化物固態混合法合成鈮酸鈉鉀-鈦酸鉍鈉鉀之無鉛壓電陶瓷，其化學式為$0.95(Na_{0.5}K_{0.5})NbO_3$-$0.05Bi_{0.5}(Na_{0.82}K_{0.18})_{0.5}TiO_3$的固溶系統，製程極化溫度分別為80°C、120°C、160°C、200°C，極化30分鐘，電場強度為3 kV/mm，分析其壓電性質以及介電性質。由電子顯微鏡及電特性分析結果顯示，其結構為斜方晶相，而$0.95(Na_{0.5}K_{0.5})NbO_3$-$0.05Bi_{0.5}(Na_{0.82}K_{0.18})_{0.5}TiO_3$系統發現，極化溫度為160°C時，電特性皆優於80°C、120°C、200°C，其電特性分別為介電常數、平面機電耦合因素、厚度機電耦合因素、壓電常數分別為903(1 kHz)、0.263、0.328、153。

關鍵詞：鈮酸鈉鉀、鈦酸鉍鈉鉀、極化、壓電性質、介電性質

The Effect of Poling Temperature on Electrical Properties of $0.95(Na_{0.5}K_{0.5})NbO_3$-$0.05Bi_{0.5}(Na_{0.82}K_{0.18})_{0.5}TiO_3$

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Abstract

In this work, the piezoelectric ceramic system of the $0.95(Na_{0.5}K_{0.5})NbO_3$ -$0.05Bi_{0.5}(Na_{0.82}K_{0.18})_{0.5}TiO_3$ is studied. The effect of poling temperature on the properties of $0.95(Na_{0.5}K_{0.5})NbO_3$-$0.05Bi_{0.5}(Na_{0.82}K_{0.18})_{0.5}TiO_3$ [NKN-BNKT] ceramic is discussed. To study the influence of poling process, the poling temperature in the range from 80 to 200°C at 3 kV/mm for 30 min.. Only an orthorhombic phase with a perovskite structure was observed. Dielectric and piezoelectric properties have maximum values at the poling temperature of 160°C. The ε_r、k_p 、k_t and d_{33} are 903 (1 kHz)、0.263、0.328、153, respectively.

Key words: $(Na_{0.5}K_{0.5})NbO_3$, $Bi_{0.5}(Na_{0.82}K_{0.18})_{0.5}TiO_3$, piezoelectric property, poling, dielectric property

無鉛壓電陶瓷「鈮酸鈉鉀-鈦酸鉍鈉鉀」變換不同燒結持溫時間其壓電與介電特性之研究

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摘要

本文採無鉛系列之鈮酸鈉鉀為主體，實驗方法以氧化物固態混合法合成，摻雜鈦酸鉍鈉鉀，其化學式為$0.97(Na_{0.5}K_{0.5})NbO_3$-$0.03Bi_{0.5}(Na_{0.83}K_{0.17})_{0.5}TiO_3$的固溶系統，其燒結溫度為1100℃持溫時間分別為3、5、7小時，分析其壓電性質以及介電性質。由XRD、電子顯微鏡、電特性分析結果顯示，其結構仍為斜方晶相，而$0.97(Na_{0.5}K_{0.5})NbO_3$-$0.03Bi_{0.5}(Na_{0.83}K_{0.17})_{0.5}TiO_3$系統中發現，燒結持溫5小時其壓電特性較為優越，其壓電與介電特性分別為介電常數、平面機電耦合因素、厚度機電耦合因素、壓電常數分別為975、0.31、0.57、145。

關鍵詞：鈮酸鈉鉀、鈦酸鉍鈉鉀、燒結、壓電性質、介電性質。

The Effect of Sintering Time on Dielectric and Piezoelectric Properties of $0.97(Na_{0.5}K_{0.5})NbO_3$-$0.03Bi_{0.5}(Na_{0.83}K_{0.17})_{0.5}TiO_3$

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Abstract

In this work, the piezoelectric ceramic system of the $0.97(Na_{0.5}K_{0.5})NbO_3$ -$0.03Bi_{0.5}(Na_{0.83}K_{0.17})_{0.5}TiO_3$ is studied. The effect of sintering time on the properties of $0.97(Na_{0.5}K_{0.5})NbO_3$-$0.03Bi_{0.5}(Na_{0.83}K_{0.17})_{0.5}TiO_3$ [NKN-BNKT] ceramic is discussed. To study the influence of sintering process, the heating time in the range from 3 to 7 hr. Only an orthorhombic phase with a perovskite structure was observed. It indicates that increasing the sintering time did not give rise to an obvious change in crystal structure. Dielectric and piezoelectric properties have maximum values at the sintering temperature of 1100°C for 5 hr. Dielectric and piezoelectric properties have maximum values at the sintering temperature of 1100 °C for 5 h. The ε_r、k_p 、k_t and d_{33} are 975 (1 kHz)、0.31、0.57、145, respectively.

Key words: $(Na_{0.5}K_{0.5})NbO_3$, $Bi_{0.5}(Na_{0.83}K_{0.17})_{0.5}TiO_3$, piezoelectric property, sintering, dielectric property.

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含氧量對鈦酸鑭摻鍶薄膜之電傳輸特性研究

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摘要

本實驗透過磁控射頻濺鍍法濺鍍鈦酸鑭摻鍶薄膜在鈦酸鍶(100)基板上，透過低溫電阻量測系統(RT system)量測鈦酸鍶摻鑭薄膜($Sr_{0.16}La_{0.84}TiO_{3+\delta}$)在於不同的氧分壓對於薄膜的電阻和溫度變化，將樣品設定在氧分壓(10^{-4}、6×10^{-5}、4×10^{-5} 、$< 2\times10^{-5}$ Torr)觀察其薄膜的電阻率及電阻變化。本實驗透過低溫電阻量測系統量測薄膜的電阻從300 K至78 K的變化，並藉由四點探針量測(van der Pauw)量測決定其電阻率，發現薄膜呈半導體或導體性質變化與樣品含氧量有關。所得到電傳輸特性，我們將以氧空缺造成之載子變化進行討論。

關鍵詞：鈦酸鑭摻鍶，電阻率，傳輸特性，氧空缺

Electrical transport properties in Sr-doped lanthanum titanate thin films with Oxygen content

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Abstract

In this study, we use a magnetron *rf* sputtering system to deposit Sr-doped lanthanum titanate thin films on $SrTiO_3$ (100) substrate. After deposition, the samples were annealing *in-situ* with oxygen partial pressure set on 10×10^{-5}, 6×10^{-5}, 4×10^{-5}, and $< 2\times10^{-5}$ Torr, respectively. The deposited films ($Sr_{0.16}La_{0.84}TiO_{3+\delta}$) with different oxygen content were measured by a low-temperature resistance measurement system (RT system) to study the resistance behavior from 300 K to 78 K. The van der Pauw measurement method was used to determine the resistivity of samples. The results show that the conducting characteristics of films were depending on the annealing oxygen pressure. The thin film transport properties were related to the oxygen vacancies.

Key words: Sr-doped lanthanum titanate, resistivity, transport properties, oxygen vacancies

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含氧量對鈦酸鑭摻鍶薄膜之晶格常數影響研究

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摘要

本實驗中採用雙靶磁控射頻濺鍍法磊晶成長鈦酸鑭摻鍶薄膜($Sr_{0.16}La_{0.84}TiO_{3+\delta}$)於鈦酸鍶($SrTiO_3$) (100)基板上。所成長薄膜分別以不同氧分壓(10^{-4} torr、6×10^{-5} torr、4×10^{-5} torr、小於2×10^{-5} torr)的情況下退火，以了解不同含氧量對薄膜晶格常數的影響。研究中藉由X-ray θ-2θ掃描，分析薄膜之*c*軸長度。並將所得之鈦酸鑭摻鍶薄膜晶格常數與塊材的晶格常數分析比較。

關鍵詞：鈦酸鑭摻鍶、晶格常數、磊晶成長、含氧量

Lattice constant of Sr-doped lanthanum titanate thin films with various oxygen contents

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Abstract

In this study, Sr-doped $LaTiO_3$($Sr_{0.16}La_{0.84}TiO_{3+\delta}$) thin films on $SrTiO_3$(100) were fabricated by the RF magnetron sputtering system. The deposited Sr-doped lanthanum titanate films were annealed under different oxygen pressure (10^{-4} torr, 6×10^{-5} torr, 4×10^{-5} torr, and $< 2\times10^{-5}$ torr). Using X-ray θ-2θ scan, the *c*-axis lengths of the films with different oxygen contents were investigated. Comparison between the calculated lattice constants of the films and the lattice constants of bulk materials will be discussed.

Key words: $Sr_{0.16}La_{0.84}TiO_3$, lattice constant, epitaxial growth, oxygen content

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利用熱蒸鍍法製備鋁鍺/錫共晶接點

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摘要

本研究利用共蒸鍍法製備一層厚度約為500 nm之鋁鍺薄膜於玻璃基板上，再沉積一層厚度約為700 nm之錫薄膜於其上。爾後放入真空環境中進行熱壓合。熱壓合溫度為400^{o}C，熱壓合時間為1~3小時。最後，利用掃描電子顯微鏡(Scanning Electron Microscope, SEM)及能量散佈分析儀(Energy Dispersive Spectrometer, EDS)進行分析。結果顯示樣品經過熱壓合後，其表面觀察到明顯的樹枝狀結構，熱壓合2小時之樣品，經過SEM之分析，發現在鍵合之界面沒有空洞的產生，證實鋁鍺錫合金結構可用於半導體IC晶粒之封裝製程。

關鍵詞：共蒸鍍，鋁鍺薄膜，熱壓合

Used the thermal evaporation method to prepare AlGe/Sn eutectic bonding joint

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Abstract

In the study, the 500nm-thick AlGe film was deposited on the glass substrate by the thermal co-evaporation method. And then the 700 nm-thick tin layer was subsequently deposited onto the AlGe film. Thereafter, the specimen was placed into a vacuum environment and performed the thermo-compression bonding. The temperature was set at 400^{o}C, and the bonding time was one to three hours. Finally, the scanning electron microscope (SEM) and Energy Dispersive Spectrometer (EDS) were used to examine the structural morphology and alloy composition. It was found that the branch structure was found easily after the thermal bounding. In addition, the void free joint can be achieved within a 2-hour bounding sample. It can be concluded that this AlGeSn alloy structure can be used in semiconductor IC package.

Key words: co-evaporation, AlGe, thermo-compression bonding

應用金錫共晶於 LED 覆晶封裝之電性研究

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摘要

在本研究中，以玻璃做為基板，在其上沉積3 μm鋁做為底層金屬，利用黃光微影製作所需的電極圖形後，以鍍液將鋁的表面原子進行鋅製換，接著以化學鎳方式鍍於鋅之上，再電鍍金錫堆疊層，完成後與LED Chip進行覆晶鍵合封裝，並將試片在真空腔體中以260℃燒結1小時使金錫形成共晶擴散，接著再進行280℃燒10分鐘以讓晶片能夠確實達到共晶點，量測其熱阻，分別以50 mA、80 mA、100 mA從25℃量測至85℃，再以定電流方式測量其順向電壓V_f，V_f會隨溫度增加而呈現下降趨勢，及以定電流驅動LED至穩定後量測基板的底部溫度，藉由接面溫度與底部溫度的差和電功率計算出熱阻約在325~350 K/W之間，而串聯電阻在50 mA下為84.97 Ω，理想因子為1.85，光功率在50 mA下點亮3分鐘後得到的值為7.7 mW。

關鍵詞：金錫共晶、覆晶封裝、熱阻

The Electric Properties of Flip-Chip LED Package by Au-Sn Eutectic bonding

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Abstract

In this study, the glass was used as the substrate, and then the Aluminum layer with a thickness of 3μm was deposited onto the glass substrate. Subsequently, the photolithography process was performed to develop the Al electrode pattern. The surface of aluminum layer was replaced by the zinc in an electrolyte solution, following a chemical Ni thin film to passive the Zn layer. Then the gold-tin stack-layers were electroplated on under-metal. After finish the bonding carrier board, the LED was bonded in Flip-Chip style in a vacuum chamber. In order to ensure the eutectic AuSn layer achieved, the temperature was kept at 260 ^{o}C for one hour and elevated to 280 ^{o}C for 10mins. After bounding, the thermal resistance was measured by using the forward voltage (V_f) method to sweep the current from 50mA to 100mA at the temperature from 25 ^{o}C to 85 ^{o}C. The forward voltage was measured in a constant current mode, at this moment, the forward voltage decreased with arising the junction temperature due to joule heating. By measuring the temperature gradient between the LED junction and the bottom of the LED package, we can calculate the thermal resistance with respect to the input power. The thermal resistance was obtained about 325 ~ 350 K/W. Under 50 mA injection, the series resistance, an ideal factor, and optical power were measured about 84.97 Ω, 1.85, and 7.7 mW, respectively.

Key words: AuSn eutectic, Flip Chip package, Thermal resistance

ITO 圖案化對晶粒之取光特性分析

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摘要

本研究為針對藍光波長之LED晶粒之粗化及對光萃取量所做之分析，設計三組光罩分別為定義工作區域、圖案化蝕刻黃光、電極設計等。利用磊晶晶片進行黃光、蝕刻、薄膜、沉積、粗化等作業，並於磊晶基板上蒸鍍銦錫氧化物(Indium Tin Oxide, ITO)，將ITO分為蒸鍍為120 nm與260 nm之不同條件，利用不同圖案之設計進行溼蝕刻開孔洞粗化內部作業分析圖案化對光輸出之變化，以及使用以ITO蝕刻液以(40℃)之條件粗化ITO表面以5秒為一取樣單位至25秒止，藉以分析未粗化與粗化後增加折射率提升光萃取之分析實驗。

關鍵詞：粗化，光萃取分析

ITO patterned light extraction characteristics of grain

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Abstract

The study focuses on the blue wavelength of LED grain of coarsening and made light extraction amount of analysis, design three sets of masks were defined work area, the patterned etching , electrode design. Use of epitaxial wafer for the yellow light, etching, thin film deposition, the operations such as roughening and the epitaxy substrate evaporation of indium tin oxide (Indium Tin Oxide ITO), the ITO divided deposition of 120 nm and 260 nm of the different conditions, the use of different pattern design wet etching patterned open holes roughened internal job analyzing the change of the light output, and the use of the ITO etching solution to conditions (40 °C) of the roughened surface of ITO 5 seconds as a sampling unit to 25 seconds only, in order to increase the refractive index analysis of experiments to enhance light extraction analysis.

Key words: roughen, light extraction

矽基金屬氧化物半導體場效電晶體之模擬分析

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摘要

近年來，金屬氧化物半導體(MOS, Metal Oxide Semiconductor)的電晶體，挾著低耗電量、製程較簡單及適合高積集度(Integration)製造等優點，已逐步的將雙載子電晶體(BJT, Bipolar JunctionTransistor)取代。鑒於 MOSFET 的重要性，本論文於是利用半導體元件模擬軟體 VisualTCAD 設計分析矽基 MOSFET 元件的工作特性。我們選擇 Drain Current 和 Gate Voltage 繪製特性曲線，畫出 Drain Current 和 Gate Voltage 的相互關係。將閘源極電壓(V_{GS})與飽和區電流(I_D)作輸入、輸出變數可得 MOSFET 的轉移特性曲線(transfer characteristic)。MOSFET 的轉移特性曲線顯示，當 V_{GS} 比 V_{GST} 小的時候，I_D 幾乎為零；當 V_{GS} 稍大於 V_{GST} 時，元件開啟(turn-on)，同時汲極電流(drain current, I_D)可被閘極電壓(gate voltage, V_G)控制。

由於我們所使用的 Visual TCAD 半導體元件模擬軟體是比較低階的配備，所以無法對元件進行更加精密的設計與分析，希望能有機會使用更高階的半導體元件模擬軟體來設計分析奈米半導體元件。

關鍵詞：金屬氧化物半導體場效電晶體，元件模擬軟體，汲極電流，閘極電壓

Simulation of a Silicon-Based Metal-Oxide Semiconductor Field-Effect Transistor

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Abstract

The metal–oxide–semiconductor field-effect transistor (MOSFET) is a transistor used for amplifying or switch in electronic signals. Nowadays, a metal–oxide–semiconductor field-effect transistor could substitutes for a bipolar junction transistor owing to its lower energy dissipation, simple processes, and *available* for integration options. In this paper, we discussed the electrical characteristics of the metal–oxide–semiconductor field-effect transistor by VisualTCAD semiconductor device simulator. After simulating the MOSFET constructed in this paper, we plot the I_D-V_{GS} curves. In this transfer characteristic of the MOSFET, we can find that when V_{GS} is less than V_{GST}, I_D is approaching to zero. In contrast, when V_{GS} is greater than V_{GST}, the device is turn-on and the drain current can be controlled by the gate voltage.

Key words: metal-oxide semiconductor field-effect transistor, device simulator, drain current, gate voltage

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矽晶圓在氧化層上的光電導測量

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摘要

我們研究不同光點位置上的矽半導體，所造成的光電導，光電導的光點位置是依賴於載子傳輸的屬性。在不同溫度下測量光電導，使用Varshni方程式，得到的能隙，是依賴著溫度。在熱激發電流測量中，由於過渡的載子在氧化層和矽晶片之間，對應到雜質的中心水平，在50 K上發現特徵峰。從這些結果，我們證明了半電導的光學特性，可以使用這些簡單的測量來確定。

The photoconductivity of the oxide layer on the silicon wafer

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Abstract

We investigate the photoconductivity caused by the different position of light spot on the silicon semiconductor. The photoconductivity is dependent on the spot position of light due to the property of carrier transport. From the measurement of photoconductivity at different temperatures, we obtained the temperature-dependent energy gap using the Varshni's equation. From the thermally stimulated current measurement, it is found that the characteristic peak at 50 K due to the transition of carrier between the oxide layer and silicon wafer corresponds to the impurity center level. From these results, we demonstrate that the optical property of semiconductor can be determined using these simple measurements.

室內監控隱藏式動態偵測影像記錄器

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摘要

以130 nm製程的數位信號處理(DSP，Digital Signal Processing/Processor)，擁有720P百萬畫素及雙通道數位H.264硬體壓縮技術，並結合2CH Camera(分別為寬動態(WDR)720P及VGA)，將影像執行H.264壓縮及事件處理並記錄在儲存裝置上。

外部事件觸發則選擇超音波測距模組，有效偵測單面3 m～2 cm內移物體，並在有效距離內通知影像處理器，將影像做出對應的處理並儲存為事件檔，以避免儲存裝置將記錄Over Write。另一方面可使使用者很快的去找到事件觸發的時間點，縮短尋找時間。Camera本身安裝不可見光IR LED光源，輔助夜間攝影，使在全黑的環境中也可發揮它的功效。

關鍵詞：DSP，H.264，寬動態(WDR)720P，VGA，超音波測距，IR LED

The indoor Surveillance Hide Motion Detection Video Recorder

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Abstract

130nm process digital signal processing (DSP Digital Signal Processing / Processor) with 720P megapixel and dual-channel digital H.264 hardware compression technology, combined with 2CH Camera (respectively wide dynamic (WDR) 720P and VGA), implementation of H.264 compression video and event handling, and recorded in the storage device.

External events trigger select Ultrasonic Ranging Module to effectively detect sided 3 m ~ 2 cm shift objects, and to notify the image processor within the effective distance make corresponding processing the image and save the file as an event, in order to avoid storage the device will record the Over Write. The other hand, allows users to find the point in time of the event trigger shorter seek time. Camera itself installed IR LED light source, auxiliary night photography, so its effectiveness can also play in the all-black environment.

Key words: DSP, H.264, wide dynamic (WDR)720P, VGA, Ultrasonic range, IR LED

隱藏式門禁系統自動偵測影像記錄器

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摘要

以紅外線感知器偵測外部有物體做動時同時提供一觸發訊號給主控系統，偵測距離為6 m ~ 8 m，並由主控系統主IC為130 nm製程的影像DSP進行訊號接收。並同步啟動影像感知器進行強制錄影的作動。強制錄影檔會透過影像DSP傳輸到SD記憶卡內，另外存取成Avi資料。其主控系統與影像感知器為隱藏於一個在人眼影像視覺波段無法由外界觀看穿透的濾光片內。此主體架構系統為隱藏於門內，進而達到隱藏式門禁系統自動偵測影像記錄器之效果。

關鍵詞：DSP，H.264，寬動態(WDR)720P，VGA，超音波測距，IR LED

The hidden Access Control system automatically detect the video recorder

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Abstract

Infrared sensor to detect external objects do move at the same time provide a trigger signal to the main control system, the detection distance for 6 m ~ 8 m, by the master control system for the main IC for the 130nm process images DSP signal reception. And synchronize the start of the image sensor actuator mandatory recording. The mandatory video file will be transmitted through images DSP to the SD memory card, another access into Avi data. The main control system and the image sensor is hidden in a visual waveband images of the human eye can not be viewed by the outside to penetrate the filter inside. This main structure of the system is hidden in the door, and thus achieve the effect of hidden access control system to automatically detect the video recorder.

Key words: infrared sensor, image DSP, image sensor, filter, SD memory card

四芯 LED 全彩節能顯示板

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摘要

本研究係針對目前RGB LED全彩顯示看板裡每一個像素中RGB之配色，再加上一顆白光LED，利用白光LED於顯示板之利用效率比其他單色的LED效率高，當白光LED利用率提高時，其他三個顏色LED的電流相對的就可降低，進而降低整體面板的平均功耗，以達到省電節能的效果。

關鍵詞：全彩顯示看板、節能

Four LED Dies Full-color Energy-saving Display Panel

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Abstract

This study focuses on current RGB LED full color display. What the RGB of color scheme was in each pixel? By adopting an extra white LED, the overall efficiency of the RGBW four dies in a pixel was higher than that of the RGB three dies. When the efficiency of white LED was raised, in the contrast, the current consumed by the other single color LEDs can be reduced. Such that the average consumed power of overall panel was thus decreased. The energy-saving effect can be easily achieved.

Key words: full color display, saving energy

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太陽能發電技術應用於通風器設計

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摘要

一般屋頂通風器的轉動是利用空氣熱對流的原理，將室內空氣的流動方向做引導，使空氣朝通風器的方向流動，增快屋內排熱速度。熱空氣朝屋頂流動，越接近屋頂處溫度越高，若排氣系統不夠完善，則室內排熱效果不彰。單純以熱對流的原理通風，降溫效果有時並不顯著，所以需藉由高效能的裝置來提高排熱效果。本研究取用太陽能做為通風器的動力來源，來優化室內通風換氣的效果，藉由太陽能電池所儲存的能量來驅動馬達旋轉風扇，裝置中應用到8501單晶片做為控制核心，透過單晶片進行馬達轉速的控制，搭配溫度感測器，將感測的溫度訊號，經由A/D轉換器將類比訊號轉為數位訊號，透過控制核心驅動馬達旋轉風扇，增設七段顯示器及鍵盤，使風扇在溫度過高或於設定的時段能自行啟動。馬達方面使用感應馬達，其特點堅固耐用、高轉速、可靠性好以及高效率，能有效發揮儲存的太陽能源。本研究選用太陽能做為能量供應來源是注重到其能源的乾淨、無汙染特性，達到節能省電的目的。

關鍵詞：太陽能通風器，8051單晶片，感應馬達

Solar Power Technology in the design of Ventilators

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Abstract

The general roof ventilators rotation is the use of the principle of air convenction. The direction of the flow of the indoor air being guided, so that the air flows in the direction towards the ventilation, so that the indoor exhaust heat speed faster. Hot air toward the roof flow, the closer to the roof at the higher temperature. If the exhaust system is not perfect, the indoor exhaust heat ineffective. The simple principle of thermal convection ventilation, sometimes, cooling effect is not significant, so it is necessary to improve the effect of exhaust heat by high efficiency device. In this study, using solar energy as a sourse of power of the ventilator, optimize the effect of indoor ventilation. The stored energy by the solar cells to drive motor and rotating fan. Application to 8051 single-chip device as control core, control the motor speed through single-chip, with a temperature sensor sensing the temperature signal, the analog signal into a digital signal by the A/D converter. Rotating fan drive motor by single-chip. Additional seven segment display and keyboard, let the fans to start their own at higher temperature or set time. Using induction motor which is characterized by rugged, high speed, reliability and high effectively can be effectively stored solar energy. In this study, use of solar energy as asource of energy focus to clean, non-polluting characteristics to achieve the purpose of energy saving.

Key words: solar ventilators, 8051 single-chip, induction motor

再生能源並聯充電系統之研究

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摘要

本論文所提之再生能源並聯充電系統，充電系統是採用太陽能模組及風力發電機兩種設備當輸入源。在輸入端使用兩組直流/直流轉換器，利用擾動與觀查法單獨或同時地從兩種再生能源中擷取最大功率並將其儲存於蓄電池。而輸出端是採用全橋式換流器，目的在於將儲存之能源轉換成市電以供使用。單晶片為整個系統之核心，其不僅可以簡化電路，且可以達到節省開發成本之目的。

關鍵詞：直流/直流轉換器，擾動與觀查法，全橋式換流器

The Research of Renewable Energy by Parallel Charging Systems

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Abstract

A renewable energy by parallel charging systems fed by photovoltaic module and wind turbine is presented in this thesis. In the input state, a dual DC/DC converter incorporated with the perturbation and observation method can draw the maximum power from the two renewable energy source simultaneously or individually and deliver it to the battery. In the output state, after full bridge inverter can transform energy into the alternating current from the battery. The center of whole system is a single chip, it is not only simplified circuit, but less expensive.

Key words: DC/DC converter, perturbation and observation method, full bridge inverter

溫度感測器對通風設備應用之影響

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摘要

無動力屋頂通風器是利用空氣對流的原理，加快散熱的速度。單純靠空氣對流來降溫，效果並不明顯，所以需要一些設備加速散熱的效果。在此使用光電太陽能板做為動力來源，將太陽能轉換成電能，並儲存在電池中，太陽能板架設將板面朝向太陽會得到最好的日照效果。經由溫度感測器感測環境中的溫度，將溫度轉化為電子數據，透過類比/數位轉換器，將類比訊號轉換成單晶片可以處理的數位訊號，傳送到89S51單晶片作訊號處理，再將資料傳送到七段顯示器顯示當時的溫度，當溫度超出所設定的範圍時，由程式內部判斷馬達的動作、速度，傳送到馬達驅動晶片，進而控制馬達的動作，驅動風扇，加快散熱的速度，當溫度越高時，調節電流讓風扇轉速增加以達到更好的散熱效果。使用太陽能板和通風器結合在一起，不但可以有效的將室內熱氣排出，而且還不用額外消耗電源。

關鍵詞：太陽能，89S51單晶片，溫度感測器，轉換器

The Effects of temperature sensor on the ventilation equipment application

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Abstract

No power roof ventilator uses air convection principle to accelerate the cooling speed. The result to use air convection cooling is not obvious. So it needs some equipment to speed up the cooling effect. It is as the power source to use the photoelectric solar panels. They Converted the solar energy to the electric energy and stored in the batteries. Solar panels erection would face towards the sun to get the best sunshine effect. The temperature sensor detected the temperature in the environment and turned the temperature into electronic data. Through the analog / digital converter, the analog signal was converted into the digital signal single chip could handle. Then, it was transmitted to the 89S51 single chip for signal processing. The data was transmitted to the seven segment and displayed the temperature. when the temperature exceeded the setting range, the program of internal judged the movement and speed of the motor. The data was transmitted to the motor drive chip. And then motor movements were controlled to drive the fan. It could accelerate the cooling speed. when the temperature was higher, to regulate the electric current let the fan rotational speed increase to achieve a better cooling effect. The solar panels and the ventilator were combined together. Not only they could effectively discharge hot gas indoor, but also they didn't consume additional power.

Key words: solar energy, 89S51 single chip, temperature sensor, converter

機械蜈蚣仿生研製

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摘要

本論文主要是使用嵌入式設計來仿生機械蜈蚣動態研製。期望能落實昆蟲生態於機器人設計上，提升動態設計的簡潔性與設計效率。考慮到伺服馬達帶動機械的效率，所以使用壓克力板製作設計機械蜈蚣本體，使用八個伺服馬達作為主軸，腳部分使用塑膠泡棉增加抓地力，並用PSCU控制器設計驅動控制伺服馬達作仿生運動。經過實驗驗證後，本論文的設計，確實可以有效率的在機械蜈蚣動作上，模仿真實蜈蚣的移動動作，對多軸輸入的伺服機控制有相當的助益。

關鍵詞：嵌入式設計、機械蜈蚣、伺服馬達、PSCU控制器

Research and Manufacture of Mechanical Centipede

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Abstract

This thesis uses the embedded design to bionic the mechanical centipede's dynamic development. Hoping to the implement insect ecology in robot design and to enhance the simplicity of dynamic design and design efficiency. Taking the efficiency of a servo motor driven machinery into account, an acrylic sheet is used to produce and design the mechanical centipede's body and eight servo motors are used as the spindle, the feet are made out of plastic foam to enhance gripping, and a PSCU controller is used to control and drive the servo motor, in order to produce bionic movement. After experimental verification, the design of this paper can efficiently enable the mechanical centipede to imitate the movements of a real centipede, and is beneficial to the multi-axis input of servo controls.

Key words: embedded design, mechanical centipede's, servo motor, PSCU controller

運用轉換十六進制成四進制之傳輸方式以降低正交頻率多工(OFDM)之峰對均值功率比

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摘要

本文提出利用轉換十六進制成為四進制之傳輸方式以降低OFDM訊號峰值對均值功率比(PAPR)，並且透過模擬方式以驗證所出的方法之PAPR降低成效，其中評比的標準係以CCDF等於10^{-3}為基準。

根據模擬結果，我們發現與十六進制的PAPR相比較，將十六進制轉換成八進制可降低2 dB的PAPR值，而十六轉成四進制則可降低3.6 dB，所提出方法比轉換成八進制的方法可改進約1.6 dB的PAPR值。

關鍵詞：峰對均值功率比，互補累積分布函數

A PAPR Reduction Scheme by transforming a 16-ary OFDM signal to a 4-ary OFDM signal

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Abstract

A PAPR reduction scheme which transforms a 16-ary OFDM signal-to a 4-ary one, is proposed for OFDM communication systems, and simulations are performance to evaluate their performances, where a CCDF 10^{-3} is used for performance evaluations.

From our simulation results and compared to the PAPR of the 16-ary OFDM signals, the proposed scheme provides a PAPR reduction of 3.6 dB that is 1.6 dB higher than that achieved by transforming a 16-ary a 8-ary OFDM signals.

Key words: PAPR, CCDF

運用專利技術元素進行RFID之停車場防盜監控指示之最佳化分析與設計

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摘要

本論文利用RFID 的專利查找出有關停車場的專利資料並加以分析，針對停車場應用的相關專利資料定義出停車場的八個應用功能，將停車場八個應用功能進行特徵項拆解，對特徵項逐一進行分析拆解，並對八個應用功能進行合併整合成最佳化的管理停車場系統。可有效停車場管理更便利、失竊率降低、車輛流通、更有效率。

關鍵詞：RFID、專利、停車場

Analysis and Design Optimization of the Burglarproof Monitoring and Guidance for Parking Based on RFID Utilizing Technical Elements of Patents

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Abstract

This research utilizes the patent of RFID to find out that publish the patent materials about parking area and analyze. the relevant patent materials employed to the parking area, define eight application functions of the parking area. The characteristic is disassembled to carry on eight application functions of parking area, analyze and disassemble the characteristic one one by one, and the management parking area system of carrying out amalgamation and exactly formating the optimization to eight application functions. The management of very effective parking area is more convenient, the suffering loss by theft rate is reduced, the vehicle circulates, more efficient.

Key words: RFID, patent, parking area

利用DSP晶片實作語音控制之研究

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摘要

本論文中，我們目的是建立一個語音命令辨識系統，並且將此系統實現在德州儀器TMS320C6713 DSK Board(DSP)上。我們利用麥克風來發號命令，透過DSP板辨認命令之後將信號發送到機器人上。主要命令有前進、後退、左轉、右轉及停五個指令。我們嘗試尋找最佳語音特徵參數抽取方法及選擇最佳隱藏式馬可夫模型之架構，以獲得最佳辨識率。本系統完成利用DSP晶片實現語音命令即時辨識的目的。

關鍵詞：TMS320C6713 DSK board、DSP、語音辨識

A Study on Implmentation of Voice Control System Using DSP Chip

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Abstract

In this paper,our aim is to build a voice command recognition system,and realization of this system on the TMS320C6713 DSK Board(DSP). We use the microphone to giving commands for the DSP board to recognition commands then sent the signal to the robot. The main command we have forward, backward, turn left, turn right and stop five instructions. We try to figure out the best selection of speech feature and structures of Hidden Markov Models (HMM) to improve speech recognition accuracy. We finished the real-time voice command recognition system on DSP.

Key words: TMS320C6713 DSK board, DSP, speech recognition

電動滑板車語音辨識應用設計

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摘要

本論文主要是利用動態時軸校正方法來設計電動滑板車語音辨識應用，期使讓低收入戶肢體殘障人士能有便利的應用交通工具。首先錄製與訓練語音資料庫，然後對語音訊號做前處理，採取梅爾倒頻譜方法擷取語音特徵值參數，再應用動態時軸校正方法比對辨識測試語音與基本語音資料庫做驗證結果。系統經由實驗驗證語音辨識應用於電動滑板車可以有效實現中低收入戶肢體殘障人士的交通工具使用普遍性，替代電動輪椅的高價位推展，真正落實民生「行」的品質。

關鍵詞：動態時軸校正、語音辨識、梅爾倒頻譜、電動輪椅

The Application of Speech Recognition in Scooter Design

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Abstract

This research applied the Dynamic Time Warping Method to design speech recognition applications for Scooters, and to make convenient transportation available for handicapped people in low-income households. Firstly, a speech database is recorded and trained, and the speech signals are pre-processed. Secondly The Mel-frequency cepstral coefficients method is used to retrieve the voice eigenvalues, and combined with the Dynamic Time Warping method, the test results are produced by comparing the recognition test speech and the speech database. Through experimental verification, speech recognition applications for Scooters can effectively universalize the transportation for handicapped people in low-income households. Not only to replace the replacing expensive electric wheelchairs but also promote the “Walking” quality of life.

Key words: dynamic time warping、speech recognition、Mel-frequency cepstral coefficients、electric wheelchairs

不同距離的灰關聯語音辨識設計

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摘要

本論文主要是應用灰色關聯度理論來辨識語音，藉此深入探討灰關聯在不同距離情況下語音辨識成功率的穩定性。系統先錄製語音資料庫，將語音做前置降噪處理作業，再以梅爾頻率倒頻譜來擷取語音特徵值，期使以灰色關聯比對資料庫的特徵值做分析辨識，落實語音辨識在不同距離下的辨識應用。

關鍵詞：交灰色關聯度、語音辨識、降噪、梅爾頻率倒頻譜

A Study of Grey Related Speech Recognition in Different Distances

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Abstract

This thesis uses the the application of the Grey Relation Grade to odentify the speech,and thus taking a deeper perspective in the discussion of the stability and the success rate of the Grey Relation Grade in speech recognition when put in different distances. First, the system records a voice database, and puts the recorded database through a pre-noise reduction process.secondly, the Mel-frequency cepstrum is used to retrieve the characteristics of speech.Hoping to analyse and identify the difference between the gray relation and the database's eigenvalues Finally,implementing the recognition and application of speech identification in different distances is also considered.

Key words: grey relation grade, speech reduction, noise reduction, Mel-frequency cepstrum

小型磁浮之電機系統分析

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摘要

磁浮電機系統必須有極高的定位以及精準控制，傳統機械雖可達到符合標準，但磁浮系統可省略掉複雜的機械構造及較大的移動需求，且優點為無噪音、低振動及低能源消耗。此模組為簡易的磁浮中心構造，當負載增加時重量上升，為保持相同的高度，線圈得增加電流，使磁鐵增加吸力。為詳細設計構造以及多樣化的測試以得到最佳的平衡點，此研究為利用Ansoft軟體研討小型磁浮電機系統，模擬模組建設不同的材質、構造以利得到數據分析，也可避免繁雜的測試，同時也可考慮選用材質不同及尺寸的搭配，以利將複雜的程序簡單化的將此系統進行有限元素分析

關鍵詞：磁浮電機系統，精準控制，有限元素

The Analysis of Small Magnetic Levitation Motor Systems

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Abstract

Magnetic levitation system must have a precision position and control. Although traditional mechanical able to meet our standards, but the magnetic levitation system can be omitted complex mechanical construction and large displacement of demand, and the advantages are no noise, low vibration and low energy consumption. This module is a simple magnetic levitation center constructed, rise when the weight of the load increases, in order to maintain the same height, the coils have increased the current, so the magnet to increase the suction. To get the best balance point for the detailed design of the constructed and diversification test, this study is discuss the small magnetic levitation motor system using Ansoft software, simulation module construction material, constructed to facilitate data analysis can be avoided with the complicated test while considering the selection of a mix of different materials and sizes, this system will simplify the complex process of finite element analysis.

Key words: magnetic levitation system, precision position, element analysis

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MgO/CoFeB/Nb(x)/CoFeB/MgO結構之垂直異向性

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摘要

本實驗是在超薄CoFeB(1.2 nm)雙層結構中改變Nb的厚度(1 nm ~ 2 nm)，並研究其交換耦合作用，這結構顯示垂直異向性是在退火後由於MgO層的穩定效果(stabilization effect)。基於同調旋轉進行模擬磁滯曲線的比較。從磁異向性常數(*K*)和交換耦合強度(*J*)的變化被包括以分析實驗結果和磁性反轉的主要特徵，顯示出了spin-flip轉變，對應於具有*J*與*K*的反平行耦合條件。我們也利用一個簡單的模型去討論並解釋磁滯曲線的特性。

關鍵詞：垂直異向性，磁異向性常數，交換耦合強度

MgO/CoFeB/Nb(*x*)/CoFeB/MgO Structures with Perpendicular Magnetic Anisotropy

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Abstract

We have studied the exchange coupling between two ultrathin CoFeB (1.2 nm) layers separated by a Nb spacer with a thickness varying from 1nm to 2 nm. These structures show well defined perpendicular anisotropy due to the MgO stabilization effect after post annealing. A simulation, based on coherent rotation,is carried out for a comparison with the magnetic hysteresis curves. The variation of both anisotropy constant (*K*) and exchange coupling strength(*J*) are included to analyze the experimental results and the main characteristic of the magnetic reversal shows a spin-flip transition, which corresponded to the antiparallel coupled condition with comparable J and K. A simple model was introduced to account the characteristics of the magnetic curves will be also discussed.

Key words: perpendicular anisotropy, anisotropy constant (*K*), exchange coupling strength(*J*)

鈷鐵氧體塊材的物理性質研究

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摘要

鈷鐵氧體在可見光區具有較大的磁光克爾效應，克服了目前市場上商用磁光存儲材料非晶態稀土-過渡金屬在短波長區的克爾旋轉角小、抗氧化能力較差的缺點，再加上其較大的矯頑力使其成為極具競爭力的高密度磁光記錄材料。但如何在保持鈷鐵氧體飽和磁化強度適當高的同時進一步提高其矯頑力，以期獲得適合高密度資訊存儲水準的磁光讀寫特性，是目前的研究熱點。

本研究利用化學共沉法製備鈷鐵氧體粉末($CoFe_2O_4$)。除了易於控制成分比例外，也成功製作純相的鈷鐵氧體塊材。利用X射線繞射實驗，顯示出有單相的特性。目前在表面分析也測量了掃描電子顯微鏡(SEM)，初步的實驗結果，顯示該樣品具有晶粒150~400 nm。此外震動樣品磁度儀(VSM)的磁性量測也顯示具有陶鐵特性，詳細的結果會再進行討論。

關鍵詞：化學共沉法，掃描電子顯微鏡，震動樣品磁度儀

Study of Physical Properties in Co-ferrite Bulk

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Abstract

Co-ferrite have a bigger magnetic-optic kerr effect in visible region. Making it a highly competitive ,to overcome market commercial magneto-optical storage material amorphous rare earth - transition metal in the short-wavelength region of the kerr rotation angle is small and poor antioxidant capacity shortcomings, coupled with its large coercivity with the high density magneto-optical recording material. But how to improve the Co-ferrite with high saturation magnetization and to increase the coercive force, in order to obtain a magneto optical read-write characteristics for high density information storage level, which is the current research focus. This research uses chemical coprecipitation preparation of Co-ferrite powder ($CoFe_2O_4$). In addition which is easy to ease control ingredients, but also successfully produced pure phase cobalt ferrite bulk. X-ray diffraction experiments, shows that there are single-phase characteristics. Surface analysis is also measured by scanning electron microscope (SEM), preliminary experimental results show that the sample with a grain of 150 to 400 nm. The results of the vibrating sample magnetometer(VSM) show that ferrite magnetic features, detailed results will be discussed.

Key words: coprecipitation, scanning electron microscope (SEM), vibrating sample magnetometer(VSM)