

基于金属亚波长光学结构窄带滤色片的研究进展

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摘要: 窄带滤色片是一种在可见光波段选择性地反射或者透射特定波长的可见光而呈现不同颜色的常用光学元件, 在液晶显示、光通信、传感探测和成像等多个领域得到广泛应用。综述了金属亚波长光学结构窄带滤色片的研究进展。根据结构形式的不同, 将金属亚波长窄带滤色片进行了划分, 主要包含了平直金属亚波长薄膜结构、金属-介质-金属腔结构、金属孔或颗粒阵列结构、金属光栅与其他结构组成的复合结构等类型。依次总结出了这些不同类别金属亚波长窄带滤色片器件的工作原理及近些年来所取得的研究进展。此外, 还介绍了基于 Fano 共振原理的金属亚波长窄带滤色片, 这类器件可以实现半峰全宽小于 10 nm 的超窄带滤色效果。

关键词: 滤色片; 窄带; 金属; 亚波长; 透射

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Research Progress of Narrowband Color Filters Based on Metallic Subwavelength Optical Structures

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Abstract: Narrowband color filters are common optical elements which selectively reflect or transmit visible light with a specific wavelength to present different colors in visible light band. They are widely applied in liquid crystal display, optical communication, sensing detection, imaging and so on. The research development of the narrowband color filters based on metallic subwavelength optical structures are reviewed. According to the different structural styles, the metallic subwavelength narrowband color filters are classified, mainly including the straight metallic subwavelength films, metal \parallel dielectric \parallel metal cavities, metallic apertures or particle arrays, and metallic gratings combined with other structures. Then, the working principles and the research progresses of late years of different types of metallic subwavelength narrowband color filters are summarized in sequence. Besides, the metallic subwavelength narrowband color filters based on Fano resonance principle, which can realize ultra \parallel narrow band filtering effects with the full width at half maximum less than 10 nm, are also introduced.

Key words: color filter; narrowband; metal; subwavelength; transmission

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基于重组蛛丝蛋白的多层级瞬态衍射光学传感元件

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摘要: 针对传统衍射光学元件(DOE)与MEMS加工工艺难以兼容、传感应用方面灵敏度低的问题, 提出了一种基于基因重组蛛丝蛋白材料、利用热纳米压印工艺制成的多层级瞬态可溶DOE。重组蛛丝蛋白性能可按需定制, 重复性高, 具有极佳的生物相容性, 高精度、高效率、低成本的纳米压印工艺可实现DOE的快速制备, 同时控制其降解速率。纳米压印工艺制备的重组蛛丝蛋白DOE最小特征尺寸可达 $2\ \mu\text{m}$, 衍射图案强度为杂散光强度的12倍。随着元件的降解, DOE的衍射图案效率降低, 说明了DOE所携带信息随其可控溶解而溶毁, 从而可以实现信息的多层级溶毁及生物传感领域的多层级药物实时释放监测。

关键词: 重组蛛丝蛋白; 衍射光学元件(DOE); 纳米压印; 多层级; 瞬态器件

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Multi- λ Level Physically Transient Diffractive Optical Sensing

Element Based on Recombinant Spider Silk Protein

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Abstract: To solve the problems of process incompatible with MEMS and low sensitivity in sensing applications of traditional diffractive optical elements (DOEs), a multi- λ level recombinant spider silk protein based physically transient DOE fabricated by thermal nanoimprinting process was proposed. The recombinant spider silk with high repeatability and excellent biocompatibility can be customized. Nanoimprinting process with high precision, high efficiency and low cost can rapidly prepare the DOEs and control their degradation rates. The recombinant spider silk protein DOE prepared by nanoimprinting process has a minimum feature size of $2\ \mu\text{m}$, and the intensity of the diffraction pattern is 12 times that of stray light. The diffraction pattern efficiency of the DOE decreases with the decrease of degradation of the elements, indicating the destruction of information stored in the DOE with its controllable degradation. Thus, the multi- λ level destruction of related information and monitoring multi- λ level drug real-time release in the biosensing field are realized.

Key words: recombinant spider silk protein; diffractive optical element (DOE); nanoimprinting; multi- λ level; transient device

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损伤恢复机制对 3D NAND 闪存保持特性的影响

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摘要: 在 3D NAND 闪存的分布式编程擦除循环实验中发现, 存储单元的保持特性随着编程擦除循环周期间隔的增加而改善。对实验数据的分析表明, 编程擦除循环周期间隔中发生了损伤恢复, 且在损伤恢复的两个机制中, 氧化层电荷逸出对保持特性的改善起主要作用, 而非界面陷阱修复。这说明, 氧化层电荷逸出对于 3D NAND 闪存的保持特性有着重要影响。此外还发现, 由于连续的电荷存储层所导致的电荷横向散布, 损伤恢复对 3D NAND 闪存保持特性的影响与存储单元的编程模式有关。综上, 损伤恢复机制是影响 3D NAND 闪存保持特性的一个重要因素, 需要在产品的可靠性表征中予以考虑。

关键词: 3D NAND 闪存; 保持特性; 耐久性; 损伤恢复; 存储器可靠性

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Impact of Damage Recovery on Retention

Characteristics in 3D NAND Flash

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Abstract: In distributed program/erase (P/E) cycling experiments of the 3D NAND flash, it's found that the retention characteristics of memory cells are improved with the increase of periodic intervals between program/erase cycles. The analysis of the experimental data shows that the damage recovery occurs during periodic intervals between P/E cycles, and in the two mechanisms of damage recovery, oxide charge detrapping rather than interface trap annihilation is responsible for the improvement of retention characteristics. It is illustrated that oxide charge detrapping has significant impact on retention characteristics in 3D NAND flash. Furthermore, it is found that the impact of damage recovery on retention characteristics of 3D NAND flash is involved with program patterns of memory cells due to charge lateral spreading induced by continuous charge storage layer. In conclusion, the damage recovery is a significant influence factor for retention characteristics of 3D NAND flash, and should to be considered in characterization of product reliability.

Key words: 3D NAND flash; retention characteristic; endurance; damage recovery; memory reliability

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稀土掺杂 GaN 基稀磁半导体材料的研究进展

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摘要: GaN 基稀磁半导体材料具有高于室温的铁磁性和优异的光电性能, 在半导体电子自旋器件领域有广阔的应用前景。系统地介绍了制备方法对稀土 Gd 掺杂 GaN 基稀磁半导体材料铁磁性的影响, 讨论了 Gd 掺杂 GaN 基稀磁半导体材料中铁磁性的起源, 介绍了除 Gd 以外的稀土离子掺杂 GaN 基稀磁半导体材料中的铁磁性, 以及共掺杂对 GaN 基稀磁半导体材料的铁磁性能的影响。目前, GaN 基稀磁半导体材料的铁磁性仍无法满足半导体电子自旋器件的要求。共掺杂工艺可以有效地解决稀土离子掺杂引入的较大晶格应变, 促进自旋电子之间的交互作用, 是一种改善 GaN 基稀磁半导体材料的铁磁性能的有效途径。

关键词: GaN 基稀磁半导体; 稀土掺杂; 自旋电子器件; 铁磁性; 磁性机理

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Research Progress on Rare Earth Ⅱ Doped GaN Ⅱ Based

Diluted Magnetic Semiconductor Materials

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Abstract: GaN Ⅱ based diluted magnetic semiconductor materials have an extensive application prospect in the field of semiconductor spin electric devices, due to the ferromagnetism above the room temperature and the excellent optoelectronic properties. The influences of the preparation methods on the ferromagnetic property of the Gd Ⅱ doped GaN Ⅱ based diluted magnetic semiconductor materials are systematically introduced, and the origin of ferromagnetism for the Gd Ⅱ doped GaN Ⅱ based diluted magnetic semiconductor materials is discussed. In addition, the ferromagnetic properties of GaN Ⅱ based diluted magnetic semiconductor materials doped with other rare earth ions except Gd and the influence of co Ⅱ doping on the ferromagnetic properties of GaN Ⅱ based diluted magnetic semiconductor materials are summarized. At present, the ferromagnetic properties of the GaN Ⅱ based diluted magnetic semiconductor materials can not meet the requirements of the semiconductor spin electric devices. The co Ⅱ doping can effectively solve the problem of larger lattice strain induced by doping rare earth ions and improve the spin Ⅱ electrons interaction. Therefore, the co Ⅱ doping is an efficient path to improve the ferromagnetic properties of GaN Ⅱ based diluted magnetic semiconductor materials.

Key words: GaN Ⅱ based diluted magnetic semiconductor; rare earth doping; spin electric device; ferromagnetic property; magnetic mechanism

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低温共烧陶瓷材料的研究进展

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摘要: 简述了低温共烧陶瓷(LTCC)介质基板的优缺点, 介绍了国内外LTCC基板材料的主要生产厂商, 综述了LTCC材料中的玻璃/陶瓷体系和微晶玻璃体系。分析介绍了国内外主要研究机构开发的玻璃/陶瓷材料, 总结了不同陶瓷材料的介电性能和热学性能; 介绍了以Ferro公司的A6系列微晶玻璃体系为代表的陶瓷材料, 总结了不同微晶玻璃材料的介电性能和热学性能。分析了LTCC材料的加工工艺, 简述了实现LTCC材料零收缩的不同技术。论述了LTCC材料在电子元器件、封装基板、功能器件和集成模块中的应用。最后指出了国内LTCC材料和技术开发的不足, 并展望了未来的研究和发展方向。

关键词: 低温共烧陶瓷(LTCC); 制造工艺; 玻璃/陶瓷; 微晶玻璃; 零收缩

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Research Progress of Low Temperature Cofired Ceramic Materials

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Abstract: The advantages and disadvantages of the low temperature cofired ceramic (LTCC) dielectric substrates are sketched. The main suppliers of LTCC substrate materials at home and abroad are introduced. The glass/ceramic LTCC system and glass // ceramic LTCC system are summarized. The glass/ceramic materials developed by the main research institutions at home and abroad are analyzed and introduced. The dielectric performances and thermal properties of different ceramic materials are summarized. As an example of ceramic materials, the Ferro A6 series glass // ceramic system is introduced. The dielectric performances and thermal properties of different glass // ceramic materials are summarized. The manufacturing technique of LTCC materials is analyzed, and different techniques to realize zero // shrinkage LTCC materials are briefly described. The applications of LTCC materials in the electronic components, packaging substrates, functional devices and integrated modules are discussed. Finally, the shortages of the LTCC materials and technological developments at home are pointed out. Furthermore, the future research and development direction of LTCC materials are prospected.

Key words: low temperature cofired ceramic(LTCC); manufacturing technique; glass/ceramic; glass // ceramic; zero // shrinkage

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一种用于称重的矩形微通道式微悬臂梁

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摘要: 矩形微通道式微悬臂梁传感器可用于检测单个微粒子或细胞的质量, 在生物和化学等领域具有非常广泛的应用前景。设计了一种含有矩形微通道的微悬臂梁结构, 建立了单个微粒子等效的集中载荷在微悬臂梁中矩形微通道的任意位置时弯曲挠度的理论模型, 分析了静态工作模式下的弯曲挠度变化以及研究了单个微粒子的质量及位置对微悬臂梁的弯曲挠度的影响, 并用 COMSOL Multiphysics 仿真软件对矩形微通道式微悬臂梁的弯曲变形进行仿真计算, 弯曲挠度的仿真结果与理论计算结果相对误差为 $1 \sim 2\%$ 。实验验证了在聚甲基丙烯酸甲酯 (PMMA) 微粒子的作用下, 微悬臂梁的最大弯曲挠度为 $2 \sim 741 \mu\text{m}$ 。

关键词: 微悬臂梁; 矩形微通道; 微粒子; 集中载荷; 弯曲挠度

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Micro Cantilever with Rectangular Microchannel for Weighing

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Abstract: The micro cantilever sensor with rectangular microchannel can be used to detect the mass of a single microparticle or cell, and has a very wide application prospect in biology, chemistry and other fields. A micro cantilever structure with rectangular microchannel was designed. A theoretical model of the bending deflection of a rectangular microchannel at any position in a cantilever beam under the equivalent concentrated load of a single microparticle was established. The variation of bending deflection under static working mode was analyzed and the influences of the mass and position of a single microparticle on the bending deflection of the micro cantilever were studied. The COMSOL Multiphysics simulation software was used to simulate and calculate the bending deformation of the micro cantilever with rectangular microchannel. The relative error of bending deflection between the simulation results and the theoretical results is $1 \sim 2\%$. The experiment verifies that the maximum bending deflection of the micro cantilever is $2 \sim 741 \mu\text{m}$ under the action of a polymethyl methacrylate (PMMA) microparticle.

Key words: micro cantilever; rectangular microchannel; microparticle; concentrated load; bending deflection

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基于 MEMS 技术的颅内压监测传感器的设计与制备

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摘要: 颅内压力的监测对颅内疾病的诊断和治疗有重要的作用, 基于硅的压阻效应, 设计了一种可用于人体颅内压力监测的植入式压力传感器。根据压阻效应原理和薄板变形理论, 完成了颅内压传感器力学结构和电学性能的设计, 然后采用微电子机械系统 (MEMS) 加工工艺完成了敏感芯片的制备, 并提出了一种具有生物兼容性的绝缘封装结构。同时搭建了绝缘性测试平台和性能测试平台, 通过测试证明封装后的传感器具有良好的绝缘性和抗渗透能力, 且其灵敏度可达到 $1 \parallel 608 \text{ mV/kPa}$, 可对颅压的变化做出响应, 为颅内压传感器的批量化生产奠定了研究基础。

关键词: 微电子机械系统 (MEMS); 传感器; 颅内压; 压阻效应; 薄板变形

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Design and Preparation of Intracranial Pressure Monitoring

Sensor Based on MEMS Technology

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Abstract: Monitoring of the intracranial pressure plays an important role in the diagnosis and treatment of intracranial diseases. Based on the piezoresistive effect of silicon, an implantable pressure sensor for monitoring the intracranial pressure in human body was designed. According to the principle of the piezoresistive effect and the theory of thin plate deformation, the mechanical structure and electrical properties of the intracranial pressure sensor were designed. Then the micro \parallel electromechanical systems (MEMS) processing technology was used to complete the pre \parallel preparation of sensitive chips, and a biocompatible insulating package structure was proposed. At the same time, the insulation test platform and performance test platform were built. The test results prove that the packaged sensor has good insulation and impermeability, and its sensitivity can reach $1 \parallel 608 \text{ mV/kPa}$, thus the sensor can respond to changes in intracranial pressure. The results lay the research foundation for the mass production of intracranial pressure sensors.

Key words: micro \parallel electromechanical system (MEMS); sensor; intracranial pressure ; piezoresistive effect; thin plate deformation

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FA 优化 BP 神经网络的 MEMS 陀螺仪

温度漂移补偿

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摘要: 微电子机械系统 (MEMS) 陀螺仪输出易受环境温度的影响, 产生温度漂移, 测量精度降低, 为解决这个问题, 提出一种萤火虫算法(FA)优化 BP 神经网络的温度漂移补偿方法, 在传统的 BP 神经网络中, 存在易陷于局部极值的问题可能降低建模精度甚至导致建模失败, 而此方法可以避免这个问题。首先在全温区 (-40 °C~+70 °C) 选取 7 个温度点进行测试, 接下来采用该方法建立 MEMS 陀螺仪温度漂移模型并进行实际验证, 验证结果表明该方法可以明显降低 MEMS 陀螺仪温度漂移, 且相比于传统 BP 神经网络, 其补偿效果也有较大幅度提升。

关键词: 微电子机械系统 (MEMS); 陀螺仪; 萤火虫算法(FA); BP 神经网络; 温度漂移补偿

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Temperature Drift Compensation of MEMS Gyroscope

Based on FA // Optimized BP Neural Network

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Abstract: The output of micro // electromechanical system (MEMS) gyroscope can be influenced by ambient temperature, resulting in the temperature drift which reduces its measurement accuracy. In order to solve above problems, based on firefly algorithm (FA) optimization BP neural network, a new method of temperature drift compensation was proposed. For traditional BP neural network, the problem of being trapped in local extremum may lower the modeling accuracy and even lead to modeling failure, and the method can avoid this problem. Seven temperature points for testing were firstly selected from the full temperature range (-40 ~+70 °C). The MEMS gyroscope temperature drift model was established by the method and was verified. The verification results show that this method can significantly reduce the temperature drift of the MEMS gyroscope. Compared by traditional BP neural network, its compensation effect also has greatly improvement.

Key words: micro // electromechanical system (MEMS); gyroscope; firefly algorithm (FA); BP neural network; temperature drift compensation

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SOI 压阻式面内加速度传感器的交叉灵敏度

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摘要: 设计了一种基于绝缘衬底上硅 (SOI) 片的面内振动压阻式加速度传感器, 并针对其交叉灵敏度性能进行了研究, 分析得出传感器的灵敏度与压阻微梁的轴向应力呈正比关系, 并通过仿真说明该结构形式的加速度传感器具有非常低的交叉灵敏度, 对检测方向的输出干扰非常小。进行了工艺加工和实验测试, 实验结果表明, 该面内振动的压阻式加速度传感器在 20 °C 下, 工作方向上的灵敏度为 $0 \pm 67 \text{ mV/g}$, 而另外两个非工作方向 (x 轴和 z 轴) 上的交叉灵敏度分别为 $7 \pm 3 \times 10^{-4}\%$ 和 $6 \pm 6 \times 10^{-4}\%$, 对工作方向的加速度检测影响非常小, 此结构的设计方法对于高性能的加速度传感器的研究具有重要的参考意义。

关键词: 绝缘衬底上硅 (SOI) 片; 面内振动; 压阻式传感器; 加速度传感器; 交叉灵敏度

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Cross Sensitivity of SOI Piezoresistive In-Plane Acceleration Sensor

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Abstract: An in-plane vibrational piezoresistive acceleration sensor based on silicon on insulator (SOI) wafers was designed, and its cross sensitivity performance was studied. The analysis shows that the sensitivity of the sensor is proportional to the axial stress of the piezoresistive micro-beam. The simulation shows that this structure of the acceleration sensor has very low cross sensitivity and the output interference to the detection direction is relatively slight. The process and experimental tests were carried out. The experimental results show that the sensitivity of the piezoresistive acceleration sensor with in-plane vibration in the working direction is $0 \pm 67 \text{ mV/g}$ at 20 °C; while the other two directions (x and z axis) are non-working directions, the cross sensitivity is $7 \pm 3 \times 10^{-4}\%$ for the x axis and $6 \pm 6 \times 10^{-4}\%$ for the z axis. The two cross sensitivities have little influence on the acceleration detection in the working direction. The design method of this structure has an important reference meaning for the study of high performance acceleration sensors.

Key words: silicon on insulator (SOI) wafer; in-plane vibration; piezoresistive sensor; acceleration sensor; cross sensitivity

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基于微流体的 ZnO 纳米线的合成

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摘要: 微流控芯片在纳米材料的合成方面具有突出的优势, 在芯片中通过微流体的操控制备 ZnO 纳米线, 并利用扫描电子显微镜 (SEM)、X 射线衍射仪 (XRD) 和能谱仪 (EDS) 对制备得到的 ZnO 纳米线的表面形貌、晶体结构及成分进行表征。实验结果表明, 在具有微腔室结构的微通道中可以构建浓度梯度, 从而在单一通道中制备得到形貌及尺寸不同的致密 ZnO 纳米线, 成为高效探索纳米材料合成条件的便捷手段。分别以玻璃片、ZnO 种子层和 ZnO 纳米线为载体, 对异硫氰酸荧光素标记的羊抗牛 IgG 抗体进行荧光检测, 发现 ZnO 纳米线可显著增强荧光信号。

关键词: 氧化锌(ZnO); 纳米线; 微流控芯片; 荧光检测; 生物传感器

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Synthesis of ZnO Nanowires Based on Microfluidics

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Abstract: Microfluidic chips have great advantages in synthesis of nanomaterials. Zinc oxide (ZnO) nanowires were synthesized by manipulating microfluidics in the chip. The surface morphology, crystal structure and composition of the as prepared ZnO nanowires were characterized by scanning electron microscope (SEM), X ray diffractometer (XRD) and energy dispersive spectrometer (EDS), respectively. The experimental results show that the concentration gradient can be established in microchannels integrated with microchambers, and the dense ZnO nanowires with different morphologies and sizes can be obtained in a single microchannel, becoming an efficient method to study the synthesis conditions of nanomaterials. Besides, the fluorescence detection of fluorescein isothiocyanate (FITC) labeled goat anti bovine IgG was carried out by using the glass substrate, ZnO seed layer and ZnO nanowires as carriers, respectively. And the results evidently show that the ZnO nanowires can significantly enhance fluorescence signal.

Key words: zinc oxide(ZnO); nanowire; microfluidic chip; fluorescence detection; biosensor

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Effects of Polishing Pressure and Pad Hardness on Polishing
Performance of PMMA || CeO₂ Core || Shell Composite Abrasives

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Abstract: Abrasive structure plays an important role in chemical mechanical polishing (CMP) processes. The uniform polymethylmethacrylate (PMMA) sphere surfaces were grafted with ceria(CeO₂) nano || particles via the chemical deposition technique, and the core || shell structured PMMA || CeO₂ composite particles were synthesized. The structures of the obtained samples were characterized by X || ray diffraction, Fourier transform infrared spectroscopy, field emission scanning electron microscopy, transmission electron microscopy and selected area electron diffraction techniques. The result shows that the influences of the amount of the cerium nitrate on the shell thickness and uniformity of CeO₂ composite particles are obviously. With the oxidized silicon wafers as the processing object, the polishing characteristics of PMMA || CeO₂ composite abrasives and commercial CeO₂ nano || particles were compared by the atomic force microscope. The experimental results indicate that the obtained composite abrasives contribute to scratch elimination and improvement of the surface quality. Furthermore, the polished surface roughness and topographical variation decrease with the decrease of polishing pad hardness and the reduction of the applied polishing pressure. The work aims to provide an experimental and theoretical basis for improving the polishing effect of composite abrasives by optimizing process parameters.

Key words: polymethylmethacrylate (PMMA); ceria(CeO₂); composite abrasive; core || shell structure; chemical mechanical polishing(CMP)

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抛光压力和抛光垫硬度对 PMMA || CeO₂ 核壳
复合磨粒抛光性能的影响

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摘要:磨粒结构在化学机械抛光(CMP)过程中发挥重要作用。利用化学沉积技术在聚甲基丙烯酸甲酯(PMMA)表面嫁接氧化铈(CeO₂)纳米粒子, 得到了核壳结构的 PMMA || CeO₂ 复合颗粒。借助 X 射线衍射、傅里叶转换红外光谱、场发射扫描电镜、透射电镜和选区电子衍射等手段对样品结构进行表征。结果表明, 硝酸铈用量对 CeO₂ 复合颗粒的壳层厚度及均匀性具有明显影响。以氧化硅片作为加工对象, 利用原子力显微镜对比了 PMMA || CeO₂ 复合磨粒与商用 CeO₂ 纳米粒子的抛光特性, 发现所得复合磨粒有助于消除划痕和改善表面质量。且随着抛光垫硬度的降低和抛光压力的减小, 抛光表面粗糙度和轮廓起伏均随之降低。本文旨在为通过优化工艺参数提高复合磨粒的抛光效果提供实验和理论依据。

关键词:聚甲基丙烯酸甲酯 (PMMA); 氧化铈 (CeO₂); 复合磨粒; 核壳结构; 化学机械抛光 (CMP)

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基于 3D 打印技术的微电子器件制造

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摘要: 传统微电子加工工艺存在着诸多限制, 尤其是无法实现具有复杂三维(3D)结构的微电子器件的加工。首先, 简述 3D 打印的工艺流程, 并详细介绍了用于微电子器件制造的三种典型 3D 打印技术。随后, 从刚性电子器件、柔性电子器件和半导体器件角度出发, 重点阐述了 3D 打印技术在微电子器件制造中的研究现状。最后, 总结了 3D 打印技术在制造微电子器件中存在的主要问题, 并讨论了基于 3D 打印技术的微电子器件制造的未来发展方向。未来微电子器件的加工将会向着体积小、重量轻、可靠性高和工作速度快等方向发展, 可任意形状成型的 3D 打印技术的迅速崛起可为研究人员提供更多的思路, 可推动交通运输、邮电通信、生物医药、文化教育以及消费类电子产品等众多领域的发展。

关键词: 3D 打印; 微电子; 微加工; 柔性电子; 传感器

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Fabrication of Microelectronic Devices Based on the 3D Printing Technology

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Abstract: Traditional microelectronic processing technology has many limitations. In particular, the processing of microelectronic devices with complex three dimensional(3D) structures cannot be realized. Firstly, the technological process of the 3D printing is briefly described, and three kinds of typical 3D printing technologies for the fabrication of microelectronic devices are introduced in detail. Then, from the perspectives of rigid electronic devices, flexible electronic devices and semiconductor devices, the research status of the 3D printing technology in the manufacturing of microelectronic devices is emphatically expounded. Finally, the main problems of the 3D printing technology in the manufacturing of microelectronic devices are summarized, and the future development direction of the manufacturing of microelectronic devices based on the 3D printing technology is discussed. In the future, the processing of microelectronic devices will develop towards the directions of small size, light weight, high reliability and fast working speed, etc. The rapid rise of the 3D printing technology that can obtain any shape will provide more ideas for researchers and promote the development of transportation, post and telecommunications, biological medicine, culture and education, consumer electronics and other fields.

Key words: 3D printing; microelectronics; micromachining; flexible electronics; sensor

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