

材料复合新技术国家实验室

The State Key Laboratory of Advanced Technology
for Materials Synthesis and Processing

论文摘要集

Abstracts

武漢工業大學

WUHAN UNIVERSITY OF TECHNOLOGY

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前 言

武汉工业大学材料复合新技术国家重点实验室于一九八七年经国家计委批准建设,于一九九〇年春建成并通过国家验收,随后正式批准向国内外开放。

本实验室研究方向的重点是材料复合新技术与新一代复合材料的研究,同时集中部分力量从事材料复合原理与材料设计的基础研究。几年来,实验室建立了一系列具有特色的材料合成与加工新技术,如自蔓延高温合成技术(SHS)、微波合成与加工技术、等离子合成与加工技术、梯度复合技术、纳米材料制备技术、单晶材料合成新技术等,并获得了一系列具有国际先进水平的成果。在新一代复合材料如纳米复合材料、精细复合材料、梯度复合材料以及机敏复合材料等方面的研究取得了重大进展。同时实验室还在新型功能材料的若干方面取得了重要成果,如采用重金属硫化物与重金属卤化物复合的方法,成功地研制了应用于 $8\sim 12\mu\text{m}$ 波段的新型红外光纤材料;成功地合成了若干掺杂铌酸盐新晶体;并获得了国际粉末衍射中心JCPDS卡片和奖状;还采用磁悬浮冷坩锅新技术在国际上首次制备出没有孪晶的大尺寸 $\text{Tb}_2\text{D}_2\text{F}_6$ 超磁致伸缩新材料,其性能指标居国际领先水平。本实验室还在材料科学基础研究与材料设计方面取得了令人瞩目的成就。如在非均质材料显微结构的研究中引入渗流、分形概念,并采用格林函数方法建立了非均质材料显微结构与性质关系定量描述的统一理论;在梯度材料设计方面建立了金属—非多属复合材料从微观到宏观的统一设计理论。此外,我们还将量子化学理论与方法应用于材料研究以及材料结构的计算模拟等,均取得了重要进展。

在这本文集中,我们收集了在1990到1993年期间实验室研究人员发表论文共307篇,涉及上述研究领域的诸方面。其中1990~1991年度发表的论文79篇,1991~1992年度发表的论文107篇,1992~1993年度发表的论文121篇。上述论文中,在国外期刊上发表的有42篇,在国际会议上发表有73篇,在国内一级学术刊物上发表的有27篇,在一般学报和期刊上发表的有65篇,在全国性学术会议上发表的有100篇。

一九九三年十二月

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Self-propagating high-temperature synthesis of NiAl

Yuan Runznang Wang Weimin and Li Qiang

We prepared an NiAl intermetallic compound and its alloys by SHS. We investigate the effect of process parameters on synthesis and the microstructure of synthesized products by X-ray diffraction, SEM, and EMPA.

刊于: International Journal of self-propagating High-Temperature Synthesis 1992

Design and fabrication of a MgO/Ni functionally gradient material

Yuan, Run zhang Lianmeng and Zhang Qingjie

The present study is concerned with the design and the fabrication of a MgO/Ni functionally gradient material (FGM). Basde on the finite-element simulation for the thermal stress produced in the fabrication, the design method for the constituent distribution in the FGM interlayers is proposed. According to the design result for the constituent distribution and by considering some practical factors in the fabrication (such as sinter shrinkage, densification process, etc.), MgO/Ni FGM with thermal stress relaxation is obtained.

刊于: Journal of Materials Synthesis and Processing, 1993

Self-propagating high-temperature synthesis of Nb-doped substoichiometric TiC_x and its characteristics

Yuan Runzhang, Yang Zhenlin and Jia Shichong

An attempt was made to modify the brittleness of TiC with niobium doped-TiC. Up to forty percent by weight of Nb was doped into TiC by SHS. Each dopant amount of Nb was characterized for phase composition, micro-hardness, lattice parameter and electrical conductivity.

刊于: International Journal Self-Propagating High-Temperature Synthesis, 1992

Fabrication of dense TiB_2 -Al composites by the self-propagating high-temperature synthesis (SHS) method

Yuan Runzhang Fu Zhengyi Z. A. Munir

Dense TiB_2 -Al composites were fabricated by the high-pressure self-pressure self-propagating high-temperature synthesis (HPSHS) method. Theoretical and experimental analysis were carried out on the SHS process. Variations in combustion temperature, Propagation rate, and sample volume and changes in the metallic content were analyzed. The mechanisms of enhancement of the composite's mechanical properties are discussed.

刊于: Journal of Materials Synthesis and Processins, Vol. 1, No. 3. 1993