

## 碳纳米管-TiB<sub>2</sub>陶瓷基复合材料的制备与性能研究

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摘要 研究了用热压烧结(HP)方法制备TiB<sub>2-x</sub>wt%CNT<sub>s-5</sub>wt%Ni(x=0.1、0.3、0.5、1、4)

复合材料的工艺条件、力学性能和微观结构. 用XRD研究了其相组成,

用SEM观察了复合材料的断口形貌和裂纹扩展. 研究表明: 碳纳米管的加入使复合材料的硬度、

弯曲强度和断裂韧性得到明显的提高, 并且在碳纳米管含量为0.5wt%左右时, 复合材料的硬度达到20.5GPa,

弯曲强度为496MPa, 断裂韧性达7.25MPa·m<sup>1/2</sup>; 断口形貌分析表明碳纳米管主要分布于TiB<sub>2</sub>颗粒的晶界处,

复合材料的增韧机制主要是碳纳米管的拔出机制和桥联机制.

关键词 [碳纳米管](#) [TiB<sub>2</sub>陶瓷基复合材料](#) [力学性能](#) [微观组织](#)

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## Preparation and Properties of Titanium Diboride Ceramic Matrix Reinforced by Carbon Nanotubes

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**Abstract** TiB<sub>2-x</sub>wt%CNT<sub>s-5</sub>wt%Ni (x=0.1, 0.3, 0.5, 1, 4) composites reinforced by carbon nanotube were fabricated by hot-pressing sintering and the prepared conditions, mechanical properties and microstructure were also investigated. XRD and SEM were used to analyze the phase and fracture surface. The results show that the hardness, bending strength and fracture toughness of the composite reinforced by carbon nanotube are increased distinctly. When the carbon nanotube content is 0.5wt%, the bending strength attains 496MPa; moreover the value of hardness and fracture toughness reaches 20.5GPa and 7.25MPa·m<sup>1/2</sup> respectively. The analysis of fracture photograph reveals that the carbon nanotube mainly distributes at the TiB<sub>2</sub> grain boundary. The main toughening mechanisms of the TiB<sub>2</sub>-CNTs-Ni composite are CNTs pulled-out and CNTs bridging.

**Key words** [carbon nanotube](#) [TiB<sub>2</sub> ceramic matrix composite](#) [mechanical properties](#) [microstructure](#)

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