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## Al<sub>2</sub>O<sub>3</sub>-ZrO<sub>2</sub>-SiC<sub>w</sub>陶瓷复合材料的显微结构和力学性能

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## MICROSTRUCTURE AND MECHANICAL PROPERTIES OF Al<sub>2</sub>O<sub>3</sub>-ZrO<sub>2</sub>-SiO<sub>w</sub> CERAMIC COMPOSITE

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摘要

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摘要 通过XRD、SEM、TEM及EPMA技术研究了Al<sub>2</sub>O<sub>3</sub>-25vol%ZrO<sub>2</sub>(2mol%Y<sub>2</sub>O<sub>3</sub>)-25vol%SiC<sub>w</sub>(AZS)三元陶瓷复合材料的显微组织和力学性能。试验结果表明,该材料具有较好的强度和韧性配合,ZrO<sub>2</sub>与SiC晶须同时起增韧作用。此外,SiC晶须以及弥散分布在Al<sub>2</sub>O<sub>3</sub>基体中的ZrO<sub>2</sub>粒子也提高了该材料的断裂强度。室温下测得该材料的压痕断裂韧性为10.8MPam<sup>1/2</sup>,抗弯强度为676MPa。

关键词: ZrO<sub>2</sub> SiC晶须 陶瓷基复合材料 韧化 强化

Abstract: The microstructure and mechanical properties of Al<sub>2</sub>O<sub>3</sub>-25 vol % ZrO<sub>2</sub> (2mol% Y<sub>2</sub>O<sub>3</sub>)-25 vol% SiC<sub>w</sub>(AZS) ceramic composite are investigated by means of XRD, SEM,TEM and EPMA in the paper. The experimental results show that the material possesses a good combination of strength and toughness. This is considered as a result of combining contribution of the transformation and microcrack toughening of ZrO<sub>2</sub> particles with the bridging and pull-out effect of SiC whiskers and bending and deflection of whiskers on cracks. The decrease of Young's modulus associated with ZrO<sub>2</sub> additives is inhibited effectively by adding SiC whiskers, and the flexural strength and Vicker's hardness of AZS are also increased by SiC whiskers and ZrO<sub>2</sub> particles dispersed in Al<sub>2</sub>O<sub>3</sub> matrix. Moreover, the indentation toughness of hot-pressed AZS shows a clear orientation. The fracture toughness and flexural strength of AZS measured at the room temperature are 10.8MPam<sup>1/2</sup> and 676 MPa respectively.

Keywords: ZrO<sub>2</sub> SiC whisker ceramic matrix composite toughening strengthening

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