陶瓷及陶瓷基复合材料及应用

Ceramics and ceramic matrix composites and applications

揭示了熔石英晶化机理、晶化动力学和熔石英晶化抑制机理，发明了 2 个系列新型熔石英基复合材料，具有良好的抗热震、耐烧蚀和介电性能，已获得应用。2005 年获得国家技术发明二等奖。

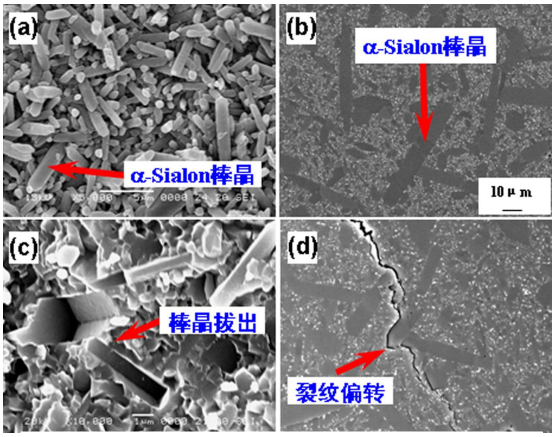
揭示了 ZrO_2 基陶瓷相变形核与长大机制及转变动力学，晶须拔出桥联与裂纹转向等多重韧化机制，使陶瓷复合材料强度、韧性提高；揭示了稀土氧化物对 ¦Ásialon 形核率及棒晶原位生长机理，研制出 BAS/Si_3N_4 新型陶瓷，使 Si_3N_4 的 ¦Á 相变和烧结温度降低近 200℃，性能显著提高。

Mechanism of crystallization kinetics and crystallization restraining mechanism for fused silica in the composites were explored. Two systems of fused silica matrix composites were invented, and successfully applied for aerospace.

Nucleation, growth mechanism and transformation kinetics of ZrO_2-based ceramics have been illustrated. Whisker reinforced $ZrO_2(Y_2O_3)$ matrix composite ceramics show two main toughening mechanisms. The mechanical properties of composites were improved by the addition of SiC whisker. Influence regulation and mechanism of the rare earth oxides on the nucleation rate of ¦Ásialon and in-situ growth of rod-like crystals were established. The sintering temperature of new BAS/Si_3N_4 ceramics decreased 200°C, and their strengths are improved at the same time.

陶瓷基复合材料样件

Ceramic matrix composites samples



自韧化 ¦ÁSialon 显微组织及断口

Fractographs and surface microstructure of the in-situ toughening ¦Ásialon ceramics