

Electroconductive Si₃N₄-MoSi₂ composites

Zhiquan Guo, High Performance Ceramics, Empa Dübendorf

Silicon nitride (Si₃N₄) and molybdenum disilicide (MoSi₂) have been considered as promising candidates as matrix material or reinforcing phase for high temperature ceramic composite. Details of the fabrication, microstructure, electrical properties and the oxidation behaviour of Si₃N₄-MoSi₂ composites containing Y₂O₃-Al₂O₃ or Lu₂O₃ as sintering additives were investigated. MoSi₂ phase reacts with N₂ sintering atmosphere during the densification process, which can be prevented by using Ar as sintering atmosphere. The percolation threshold of the MoSi₂ phase in the composites is ~28 vol.%. The composites with MoSi₂ content higher than 30 vol.% are good conductors with room temperature electric resistivities ranging from 10⁻³ to 10⁻⁵ Ω·cm and they show metallic-like conduction – the electric resistivity increases with temperature. Compared to Y₂O₃-Al₂O₃, the use of Lu₂O₃ as sintering additive shows beneficial effect on the oxidation resistance at 1200 °C.