Chaoying Ni et al., J Material Sci Eng 2017, 6:4(Suppl)
DOI: 10.4172/2169-0022-C1-070

Structural and thermal properties of reaction bonded SiC/Si composite

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The thermal conductivity (κ) of a reaction bonded SiC/Si composite as a function of SiC percentage and temperature was characterized. The κ value strongly associates with the SiC percentage and the inclusion of Si in SiC significantly decreases the κ value. The interfaces of both SiC/Si and SiC/SiC have significant contribution to the thermal resistivity. HRTEM confirms the existence of stacking faults and dislocations within the SiC phases near the interfacial region. In addition, an amorphous thin layer exists at the large angle grain boundary where significant lattice mismatch exists between SiC and Si during the crystal growth at the fabrication temperature. At a measurement temperature of about 1100°C, the κ value levels off and deviates from a general downward trend, suggesting a mechanism of structural evolution in the composite. The *in-situ* TEM heating test confirms the phase transformation of a-Si to crystalline Si at elevated temperatures.

Biography

Chaoying Ni centers his research interest on the structural and property characterizations of advanced materials using Transmission Electron Microscopy (TEM) and Scanning Electron Microscopy (SEM). His expertise includes electron crystallography and e-beam associated spectroscopy. His active efforts are on the process-structure-property relationships of advanced composites, materials for energy or environment, mechanistic interpretation of thermal properties, mesoporous crystals, functionalized nanostructures and assemblies, thin films, interfaces and coherence growths.

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