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# Thermal properties of SiC particle-dispersed $ZrB_2$ matrix composites

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**Abstract** – SiC particle-dispersed $ZrB_2$ matrix composites were sintered using spark sintering process. Thermal conductivity and emissivity of the composites were measured. Effects of SiC particle dispersion of the composites were examined.

SiC particle-dispersed $ZrB_2$ matrix composites are expect to be used for high temperature applications. However, effects of SiC particle dispersion on their thermal properties are not examined. In this study, SiC particle-dispersed $ZrB_2$ matrix composites were fabricated, and effects of SiC particle dispersion on thermal properties were examined.

SiC particle-dispersed $ZrB_2$ matrix composites with different particle size and particle volume fraction were sintered by spark plasma sintering process. Crystal structure of the sintered composite was determined by XRD. Porosity of the composites was Archimedean method. Dispersion of SiC particles was examined by SEM.

Thermal diffusivity of the composites was measured on a ~10 mm diameter disk shape specimen with ~2 mm thickness, using the laser flash method. Heat capacity and thermal conductivity of the composites were determined. In-line light reflectance and total light reflectance of the composites were measured in a wavelength range from 1 to 25 μm, using FT-IR and UV/Vis/NIR spectrophotometer. Emissivity of the composites was estimated from light absorption using Kirchhoff's law.

Thermal conductivity of the composites shows dependence on particle diameter and particle volume fraction. Reflectance of thermal radiation energy and emissivity of the composites also depends on particle volume fraction. Based on the measured thermal properties, effects of SiC particle dispersion on thermal properties of $ZrB_2$ matrix composites will be discussed.