HIGH TEMPERATURE MECHANICAL PROPERTIES OF BN PARTICLE DISPERSION SIC COMPOSITES

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Silicon carbide composites basically require weak fiber/matrix interphase like carbon or boron nitride (BN). The interphase material and its thickness are keys to determine mechanical properties. However precise control is the critical issue in terms of large scale production and material cost. The interphase is the weakest link for the environmental effects. The SiC composites were developed by applying BN particle dispersion in SiC matrix without the interphase. The objective is to understand the high temperature mechanical properties of the SiC composites.

Silicon carbide composites were fabricated by liquid phase sintering method. Silicon carbide with BN matrix was formed by mixture of SiC and BN powder in which BN volume fraction was controlled within the range of 20~50%. Mechanical properties were characterized by tensile test before and after exposure in air up to 1750C. Low cycle fatigue tests of the composites reinforced with satin weave fibers were also carried out in air at 1150C. Microstructures and fracture surfaces were characterized by FE-SEM.

The BN particle dispersion SiC composites have uniform microstructure through thickness. No significant degradation of tensile strength wasn't observed following exposure up to 1500C in air. Oxidation of the composites were limited to near surface in particular for the fiber bundle region up to 1500C as shown in figure 1. Left regions in the figures are fiber bundle regions. The composites reinforced with satin weave fibers didn't break following over 1 million cycles applying 140 MPa at 1150C in air. The specimens had no oxidation resistant coating like CVD SiC.

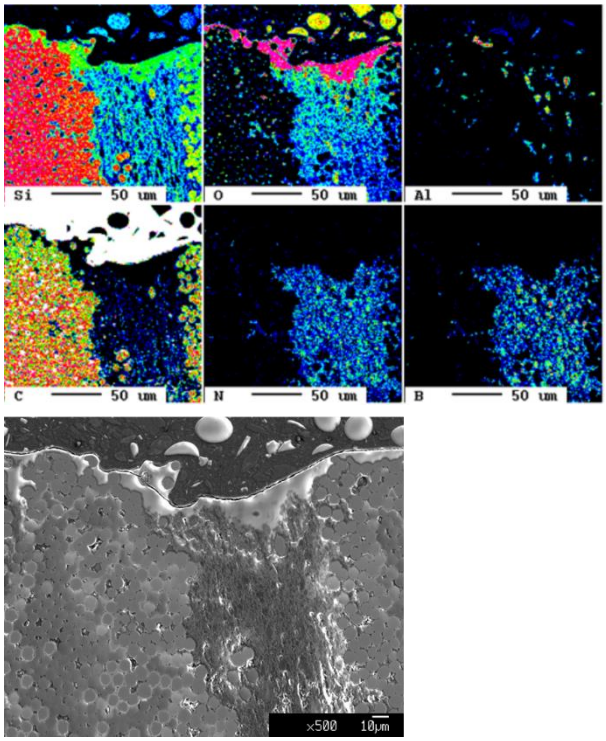

Figure 1 – Elementary mapping of BN particle SiC composites following exposure at 1500C in air