Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

SiC-Si interfacial thermal and mechanical properties of reaction bonded SiC/Si ceramic composites CHUN-YEN HSU, FEI DENG, PRASHANT KARANDIKAR, CHAOYING NI, University of Delaware — Reaction bonded SiC/Si (RBSC) ceramic composites are broadly utilized in military, semiconductor and aerospace industries. RBSC affords advanced specific stiffness, hardness and thermal. Interface is a key region that has to be considered when working with any composites. Both thermal and mechanical behaviors of the RBSC are highly dependent on the SiC-Si interface. The SiC-Si interface had been found to act as a thermal barrier in restricting heat transferring at room temperature and to govern the energy absorption ability of the RBSC. However, up to present, the role of the SiC-Si interface to transport heat at higher temperatures and the interfacial properties in the nanoscale have not been established. This study focuses on these critically important subjects to explore scientific phenomena and underlying mechanisms. The RBSC thermal conductivity with volume percentages of SiC at 80 and 90 vol% was measured up to 1,200 C, and was found to decrease for both samples with increasing environmental temperature. The RBSC with 90 vol% SiC has a higher thermal conductivity than that of the 80 vol%; however, is still significantly lower than that of the SiC. The interfacial thermal barrier effect was found to decrease at higher temperatures close 1200 C. A custom-made *in-situ* tensile testing device which can be accommodated inside a ZEISS Auriga 60 FIB/SEM has been setup successfully. The SiC-Si interfacial bonding strength was measured at 98 MPa. The observation and analysis of crack propagation along the SiC-Si interface was achieved with *in-situ* TEM.

Chun-yen Hsu
University of Delaware

Date submitted: 17 Nov 2015 Electronic form version 1.4