Abstract Submitted
for the TSS10 Meeting of
The American Physical Society

Elastic Properties of Silicon Carbide Nanowires and Nanosize Grains up to 75 GPa T.W. ZERDA, Texas Chistian University — Silicon carbide nanowires of average diameter of 30 nm and narrow size distribution were sintered from carbon nanotubes and silicon at 1200°C. X-ray diffraction measurements of those SiC nanowires were conducted in a diamond anvil cell at room temperature and pressures up to 55 GPa applied by an alcohol medium. We used the same technique to study SiC grains of various sizes. The pressure-dependent volumes of the respective unit cells were calculated from the diffraction data, and the bulk moduli extracted from these studies depended on the particle size: 260 GPa for the 20 nm grains, 198 GPa for the 50 nm grains, and 193 GPa for the 130 nm grains. The bulk modulus of the 30 nm SiC nanowire was found to be 240 GPa. The bulk modulus study was extended to 75 GPa of pressure by use of a diamond anvil cell cryogenically loaded with an argon pressure medium. The bulk modulus was unchanged in this extended pressure range. The elevated bulk modulus of 20 nm grains is explained by the core-shell model developed by Palosz, *et al.* The core atoms exhibit all the properties associated with the bulk material, but the interatomic distances of shell atoms may differ. With nano-sized materials, a much larger percentage of the constituent atoms belong to the shell.

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Date submitted: 22 Feb 2010 Electronic form version 1.4