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SiC-CNT Multifunctional Nanocomposites for High Temperature Structural, Thermoelectric and Sensing Applications

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The purpose of this project is to study the thermal-electrical and mechanical properties of the Nanojunctions between Single-Wall Carbon Nanotubes (SWCNT) and Silicon Carbide (SiC). The mixture was done by spreading the nanoparticles in a solution of ethanol and SiC, then sintered to a solid sample of 10 mm x 10 mm x 35 mm, which was attached with Alumel (Ni-Al) wire using silver epoxy to form a circuit for recording during fracture testing. The carbon nanotubes used were approximately 60% semiconducting and 40% metallic. The themal-electrical effect changed when SWCNTs (at 2, and 5 wt%) were infused into SiC. The change was expected to be produced from the imperfections induced by the fratures. Although the Seebeck coefficient was in a similar range with different SWCNT concentrations and combinations (Boron, SiC nanoparticles), the mechanical properties were expected to change. The resistance also slightly increased with the increase in deformation of the specimen. Finally, the structures created were analyzed in a SEM (scanning electron microscope) and XRD (X-Ray Diffraction) after they had failed. The results show that there were networks created by SWCNTs with Nano junctions (NJ) inside the SiC matrix and enhanced the thermal-electrical and mechanical properties in the combined SiC+SWCNTs composite material.