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Novel 3-dimensional nanocomposite of covalently interconnected multiwalled carbon nanotubes using Silicon as an atomic welder LAKSHMY PULICKAL RAJUKUMAR, Pennsylvania State University, MANUEL BELMONTE, BENITO ROMAN, Instituto de Ceramica Y Vidrio, CSIC, JOHN SLIMAK, ANA LAURA ELÍAS, EDUARDO CRUZ-SILVA, NESTOR PEREA-LÓPEZ, Pennsylvania State University, AARON MORELOS-GÓMEZ, Shinshu University, HUMBERTO TERRONES, Rennselaer Polytechnic Institute, PILAR MIRANZO, Instituto de Ceramica Y Vidrio, CSIC, MAURICIO TERRONES, Pennsylvania State University — There is a growing interest in synthesizing three-dimensional (3-D) carbon nanotube structures with multi-functional characteristics. Here, we report the fabrication of a novel composite material consisting of 3-D interconnected multi-walled carbon nanotubes (MWNTs) with Silicon Carbide (SiC). The material was synthesized by a two-step process involving the chemical coating of MWNTs with Silicon oxide, followed by Spark Plasma Sintering (SPS). SPS enables the use of high temperatures and pressures that result in carbothermal reduction of silica and densification of the material into a 3-D composite block. Covalent interconnections of MWNTs are facilitated by a carbon diffusion process resulting in SiC formation during SPS. The presence of SiC in the sintered composite has been confirmed through Raman spectroscopy, which shows the characteristic peak close to 800 cm^{-1} and also EFTEM maps. XRD, SEM, EDX and HRTEM have also been used to characterize the produced material. Interestingly, a high thermal conductivity value (16.72 W/mK) and a 3-D variable range hopping (VRH) electron hopping was observed in the sintered composite.

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