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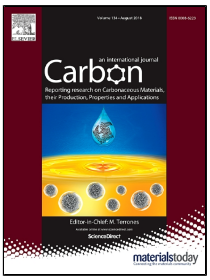

Enhanced electrical and thermal conductivities of silicon oxycarbide nanocomposites containing carbon nanofibers.

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Title: Enhanced electrical and thermal conductivities of silicon oxycarbide nanocomposites containing carbon nanofibers.

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Abstract

Novel silicon oxycarbide-carbon enriched composites (SiOC-C) were prepared from mixtures of SiOC and different amounts of carbon nanofibers (CNF) (0-10%) sintered through spark plasma sintering at 1500 ºC. During sintering, the SiOC matrix experiences a rearrangement to SiO_2, SiC and C, and the growth of SiC wires within the material which produce epitaxial graphene-like carbon flakes with AB stacking. Small additions of CNFs (0.5-1%) promote the generation of large amounts of β-SiC which produce more graphene-like carbon. When large amounts of CNFs are added graphene-like carbon and also huge entanglements of turbostratic carbon are formed widespread all over the SiOC-C material. These facts deeply influenced the observed properties. Small additions of CNFs (0.5-1%) produce an improvement of the thermal conductivity of 30 % and an enhancement of three orders of magnitude in the electrical conductivity ($2.44x10^{-3}$ to 1.82 Sm^{-1}) mainly due to a great increase in both the crystallite size and structural order of SiC and also the presence of graphene-like carbon homogenously dispersed within the SiOC matrix. Further additions of CNFs (10%) continue increasing both thermal and electrical conductivities (40% and 100 Sm^{-1}, respectively) but such increases are less effectively by the presence of entanglements of turbostratic carbon.

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