The effect of precursor system on the resistivity and oxidation susceptibility of C/SiC nanocomposites on route to electronic grade nanomaterials

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Herein, presented are results of a study on specific properties of affordable C/SiC composite nanomaterials obtained via pyrolysis of several pitch/silicon-bearing precursor systems (SiO_2, commercial SiC, Si, poly(carbosilane) [-CH_2-Si(H)CH_3-]$_n$). The formation of nanosized –SiC was detected after pyrolysis at 1300°C in the systems with elemental Si and poly(carbosilane) while treatment at 1650°C was required for the system with SiO_2 to yield similar conversion effects. The nano-SiC was homogeneously dispersed in the simultaneously evolving graphitic carbon matrix of the composites. Electrical resistivities, reactivities vs. CO_2, and surface properties of the nanocomposites were determined. Significant differences and specific patterns in the properties of the materials obtained from these precursor systems at selected pyrolysis temperatures were established. Among others, the data suggest a potential for carbon removal from the most reactive nanocomposites via reactions with CO_2 to yield unique nano-SiC powder products for further processing towards electronic and ceramic applications.

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