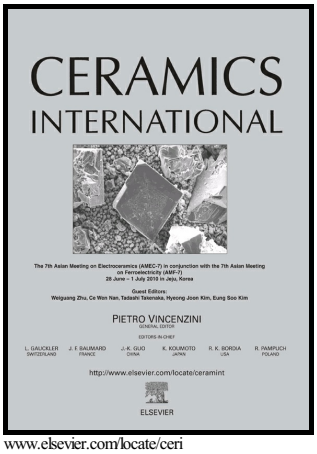

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Catalytic graphene formation in coal tar pitch- derived carbon structure in the presence of SiO_2 nanoparticles

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Abstract

A simple and effective way to manufacture graphene from a coal tar pitch (CTP) is demonstrated. Silica (SiO_2) nanoparticles were used to modify the CTP as carbon precursor. A silica nanofiller introduced into the CTP matrix underwent carboreduction during heat treatment to 2000 ^oC, resulting in the formation of silicon carbide. Surfaces of SiC grains were sites for graphene formation. The influence of SiO_2 on the structure and microstructure of CTP- based carbon matrix, after annealing up to 2800 ^oC, was studied. Carbon samples were analyzed using X- ray Diffraction (XRD), Transmission Electron Microscopy (TEM) and Raman Spectroscopy. Crystallite sizes (L_a, L_c) and interplanar distance (d_{002}) were determined. The presence of SiO_2 in CTP carbon precursor favored the crystallites' growth in the 'a' crystallographic graphite direction, and inhibited their growth on the 'c' axis. The crystallites composing of graphene layers, were characterized by an elongated dimension in the 'a' axis direction. Above 2000 ^oC silicon carbide decomposed, followed by the sublimation of silicon from the carbon matrix.