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Carbon Arc Plasma Synthesis Of Nano-SiC

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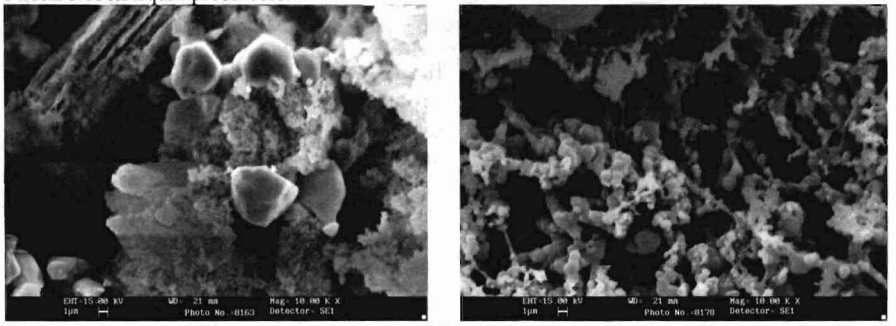
Silicon carbide (SiC) is an important structural ceramic with many applications. Nanoscale 1-D structures possess novel exotic electronic and mechanical properties. Earlier [1] we showed that SiC nanofibres are efficiently synthesized via SHS route with Si/PTFE mixture as starting reactants. Surprisingly, the process yield seemed to be improved in oxygen-rich atmosphere. Hence our attempt presented here to produce SiC nanostructures via a fast, direct arc synthesis either in O_2-rich plasma or using oxygen-containing reactants (SiO_2, SiO). Consumable composite (C/Si, C/SiO and C/SiO_2) anodes were sublimated in a DC (arc current within 10-40 A) plasma set-up which has been commonly used here to produce fullerenes, carbon nanotubes and encapsulates for years [2]. The arc was struck at the pressure equal to 300 hPa in He-O_2 atmosphere (oxygen content 0, 2 and 20 vol.%). Optical emission diagnostics was performed to characterize the arc plasma [3]. The collected products were examined using SEM, XRD and wet chemistry techniques. The influence of process parameters on the composition and morphology of products was studied. SEM image (left) shows the presence of sub-micrometer crystalline SiC and exfoliated graphite while yet un-identified 1-D nanostructures (carbon nanotubes, SiC nanofibres?) are spotted in SEM image on the right. Using aerosol route [4], nano-SiC powders (with the specific surface up to 77 m^2/g) were also synthesized from various oxygen-containing silicon/carbon liquid precursors.



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