Formation and Characterization of Carbon and Ceramic Nanostructures

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Abstract Different carbon and ceramic nanostructures (nanotubes, nanowires, nanofibres, nanorods, and nanoencapsulates) have great potential for improving our understanding of the fundamental concepts of the roles of both dimensionality and size on physical properties, as well as for many potential applications. Carbon nanotubes (CNTs) were produced in carbon arc plasma using different starting carbons, as the anode material. Low-graphitized carbons (including carbon black) proved to be much more efficient comparing to the regular graphite material. The optical emission and absorption spectroscopy was used for spectral diagnostics of the carbon arc. Carbon arc was also used to produce carbon onions containing magnetic nanocrystallites (Fe and magnetic alloys) in the core. The process was optimized and the procedure to isolate encapsulates was elaborated. Carbon nanocapsules containing Fe were also obtained via combustion synthesis from mixtures NaN_3-C_6Cl_6-Ferrocene. This technique also proved to be very efficient to produce silicon carbide nanowires from Teflon (PTFE) and different reductants ($CaSi_2$, Si). The protocol to isolate and efficiently purify the final product (up to 98 wt%) was proposed.

Synthesis of Carbon Nanotubes in Carbon Arc

We have studied the CNTs synthesis by using the arc discharge technique as well non-equilibrium plasmas, e.g., [1–12]. The aim of those studies was also the plasma diagnostics based mainly on optical emission spectroscopy (OES), e.g. [13–18].

In this work we summarize our recent research in which the influence of carbon electrode structure on effectiveness of single-walled carbon nanotubes (SWCNTs) formation in the carbon arc discharge under the presence of catalysts

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