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Controlling synthesis of carbon nanostructures by plasma means in arc discharge OLGA VOLOTSKOVA, ALEXEY SHASHURIN, JON TORREY, GWU, YEVGENY RAITSES, PPPL, MICHAEL KEIDAR, GWU — Thermal stability of SWNTs at conditions of atmospheric arc is crucial for determination of region of their synthesis in arc and in general for clarification of the thermal regime of SWNT in arc plasmas. We investigated electrical resistance dependence on temperature of mats of SWNTs under variable pressures in helium atmosphere, in the air and in vacuum in high temperature ranges (300-1200K) which closely mimic conditions during the synthesis in arc discharge. Dependence of SWNT resistance on temperature exhibits similar "V-shape" behavior for all applied conditions which characterized by two temperatures: Tmin (temperature of the minimum of resistance) and Tcr (temperature of destruction of SWNT bundles). It is found that Tmin and Tcr increased with helium pressure, so that at 500 Torr Tcr was 1100K, while Tmin -900K. This is the temperature that corresponds to buffer region between the arc plasma and helium background in arc discharge. Based on that it can be suggested that region of formation of SWNTs in arc should be close to arc periphery. Our study also demonstrates a strong effect of electric and magnetic fields on properties and growth conditions of SWNTs and other carbon nanostructures such as graphene. These effects are quantified by variety of diagnostics tools: SEM, TEM, AFM - microcopies, TGA, RAMAN and UV-vis-NIR.

Olga Volotskova
George Washington University

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