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Controllability of the arc plasma-based synthesis of single-walled carbon nanotubes JIAN LI, OLGA VOLOTSKOVA, ALEXEY SHASHURIN, MADHUSUDHAN KUNDRAPU, MICHAEL KEIDAR, The George Washington University — The focus of this work is to understand the mechanism of magnetic-field-enhanced plasma synthesis, further to establish the fundamental correlation between parameters of arc plasma and characteristics of single-walled carbon nanotubes (SWNT) and increase the controllability and flexibility of arc discharge method. The influence of magnetic field on SWNT parameters is demonstrated as following: (i) It can increase the length of SWNT by a factor of 2 and the population of long nanotubes with the length above 5 μm. (ii) It can result in substantial fractions of produced SWCNTs being of small diameter, less than 1.3 nm. (iii) It can change the chirality distribution of SWNT and the ratio of metallic to semiconducting SWNT. Additionally, the explanations of these findings are presented in the study of voltage-current characteristics of arc plasma, the analysis of size distribution of catalyst particles, the diffusion model of carbon adatom by Monte Carlo and numerical simulation of arc discharge ablation.

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