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Anode Sheath Transition In a Carbon Nanotube Arc Discharge¹ ABE FETTERMAN, YEVGENY RAITSES, Princeton Plasma Physics Laboratory, MICHAEL KEIDAR, George Washington University — An atmospheric pressure helium arc discharge is used for carbon nanotube synthesis. The arc discharge operates in an anodic mode with the ablating anode made from a graphite material. For such conditions, existing models predict the electron-repelling (negative) anode sheath [1]. In the present experiments, the anode ablation rate is investigated as a function of the anode diameter. It is found that anomalously high ablation occurs for small anode diameters (< 0.4 cm). This result is explained by the formation of an electron-attracting (positive) anode sheath leading to increased power losses on small anodes as compared to larger anodes. The suggested mechanism for the positive anode sheath formation is plasma convergence. The increased ablation rate due to this positive sheath could imply a greater yield of carbon nanotube production.

[1] M. Keidar et al, J. Nanosci. Nanotech.6 (2006) 1309

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