Abstract Submitted
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Self-Organization of Plasma and Material Processes in the Carbon Arc Discharge[1] YEVGENY RAITSES, JONATHAN NG, Princeton Plasma Phys Lab — The atmospheric pressure carbon arc in helium is an important method for the production of nanomaterials [1]. Typical arcs operate in a dc mode between a graphite anode, which is consumed, and a cathode which may be a lower melting point material, which remains undamaged [2,3]. During the arc operation, a carbon deposit is formed on the cathode surface and plays a crucial role in conducting the arc current. Temperature measurements demonstrate that a sufficiently large area of the cathode deposit is hot enough for thermionic emission to be the source of most of the arc current [4,5]. Structural evaluation of the carbon deposit and an analysis of the energy balance at the anode and the arc-cathode interface suggest that the evaporation of the graphite anode and formation of the carbon deposit on the cathode are self-organized to maintain the current conduction in the arc and can probably be generalized for other arc synthesis methods with consumed anodes [5].

[1] Journet et. al. Nature 388:756 (1997);
[2] Keidar, Beilis, J. Appl. Phys 106, 103304 (2009);
[3] Fetterman, Raitses, Keidar, Carbon 46, 1322 (2008);
[4] Hantzsche, Beitr. Plasmaphys., 22, 325(1981);
[5] Ng and Raitses, in press, Carbon (2014).

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