Abstract Submitted
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Nanoparticles growth regions in carbon arc: simulations and experiments[1] ALEXANDER KHRABRY, SHURIK YATOM, VLADISLAV VEKSELMAN, IGOR KAGANOVICH, ANDREI KHODAK, YEVGENY RAITSES, Princeton Plasma Phys Lab — Growth of nanoparticles (NPs) in atmospheric pressure carbon arc in helium was modeled in 2D. Non-equilibrium plasma model was coupled to heat transfer in electrodes and multiple surface physics phenomena, such as radiation, electron emission, ion recombination, space-charge limited sheaths. This allowed accurate prediction of carbon ablation region at the anode surface, carbon transport to colder regions outside the arcing volume where it condenses to form NPs, with their further coagulation [1]. Chemical composition of the plasma gas was computed; good agreement on C_2 molecules density profile with results of LIF measurements [2] was obtained. The simulations showed that C_2 and C_3 molecules are precursors for the formation of NPs. Consumption of carbon gas for the NPs growth is fast, preventing formation of larger carbon molecules. Thermal convection of gas heated by the electrodes affects the shape of NPs growth region, while the role of particle diffusion is small. The shape of the NPs growth region and the NPs sizes simulated were in a good agreement with results of LII measurements [3]. [1] P. Kappler et al., J. Appl. Phys. **50** (1979), 308. [2] V. Vekselman et al., Plasma Sources Sci. Technol. **27** (2018) 025008 [3] S. Yatom et al., MRS Comm. (2018) doi:10.1557/mrc.2018.91

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Alexander Khrabry
Princeton Plasma Phys Lab

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