Abstract Submitted
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Experimental and Theoretical Study of the Carbon Arc: from Plasma to Nanomaterial Synthesis[1] VLADISLAV VEKSELMAN, ALEXANDER KHRABRY, BRENTLEY STRATTON, IGOR KAGANOVICH, YEVGENY RAITSES, Princeton Plasma Phys Lab, LABORATORY FOR PLASMA NANOSYHTHESIS TEAM — A carbon arc for nanomaterial synthesis was comprehensively studied using spectroscopic techniques and modeled by specially modified computationally fluid dynamic (CFD) code ANSYS. The arc was operated at near atmospheric pressure of He background gas. Under these conditions, the carbon arc plasma is generated and sustained by ablation of the graphite anode. The same process generates carbon feedstock for carbon nanomaterials synthesis. We performed experimental study and CFD modeling to fully characterize plasma and carbon composition in the synthesis region that is important for understanding of synthesis of carbon nanomaterials by the arc method. This study revealed dimensions of the hot arc core and a cooler region of the arc periphery where synthesis of nanostructures occurs. Measurements and simulations show that the main component in the synthesis region is C_2, which is a key precursor for synthesis of carbon nanostructures. Measurements of the voltage drop in the arc confirms hypothesis that the enhanced ablation occur due to transition of the anode sheath from electron-repelling at low arc currents to electron-attractive at high currents.

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