Abstract Submitted
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Laser-induced incandescence (LII) diagnostic for in situ monitoring of nanoparticle synthesis in a high-pressure arc discharge.[1] SHURIK YATOM, VLADISLAV VEKSELMAN, JAMES MITRANI, BRENTLEY STRATTON, YEVGENY RAITSES, Princeton Plasma Phys Lab, LABORATORY FOR PLASMA NANOSYNTHESIS TEAM — A DC arc discharge is commonly used for synthesis of carbon nanoparticles, including buckyballs, carbon nanotubes, and graphene flakes. In this work we show the first results of nanoparticles monitored during the arc discharge. The graphite electrode is vaporized by high current (60 A) in a buffer Helium gas leading to nanoparticle synthesis in a low temperature plasma. The arc was shown to oscillate, which can possibly influence the nano-synthesis. To visualize the nanoparticles in-situ we employ the LII technique. The nanoparticles with radii >50 nm, emerging from the arc area are heated with a short laser pulse and incandesce. The resulting radiation is captured with an ICCD camera, showing the location of the generated nanoparticles. The images of incandescence are studied together with temporally synchronized fast-framing imaging of C2 emission, to connect the dynamics of arc instabilities, C2 molecules concentration and nanoparticles. The time-resolved incandescence signal is analyzed with combination of ex-situ measurements of the synthesized nanoparticles and LII modeling, to provide the size distribution of produced nanoparticles.

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