Abstract Submitted
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Sound generated by small perturbations of power in high-pressure arcs[1] FEDOR POPOV, MIKHAIL SHNEIDER, Princeton University — We propose a simple analytical theory to describe the sound generated by small periodic perturbations of a cylindrical dc arc in a dense gas. Theoretical analysis was done within the framework of the conventional channel arc model with an effective channel radius and a given fluctuating Joule's heat. The arc channel model was supplemented with time-dependent gas dynamic equations. Estimation formulas for the generated sound intensity in the near field were obtained. In the peripheral region of an arc with graphite electrodes burning in a high pressure inert gas, a large number of microscopic soot particles are produced together with nanoparticles. Experimental studies have shown that exposure of the peripheral region of the arc to intense ultrasounds (˜100 - 120 dB) lead to a noticeable increase in the efficiency of the synthesis of nanoparticles and to the reduction in the yield of soot [1]. It was shown in [2] that ultrasounds, acting on the suspension of soot microparticles and nanoparticles in gas result in the coagulation of soot particles, without noticeably affecting the small-scale nanoparticles. Our estimates show that relatively small perturbations of the power in a high-pressure arc (at the level of several percent) can be a source of high-intensity sound comparable to that used in experiments [1]. 1. G.N. Churilov, Nanotubes and Carbon Nanostructures, 16,5-6, 395 (2008) 2. M.N. Shneider, AIAA 2016-1693, San Diego, CA, 2016

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