Abstract Submitted
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A numerical study on liquid charging inside electrostatic atomizers[1] BABAK KASHIR, ANTHONY PERRI, ABHILASH SANKARAN, CHRISTOPHER STASZEL, ALEXANDER YARIN, FARZAD MASHAYEK, Univ of Illinois - Chicago — The charging of the dielectric liquid inside an electrostatic atomizer is studied numerically by developing codes based on the OpenFOAM platform. Electrostatic atomization is an appealing technology in painting, fuel injection and oil coating systems due to improved particle-size distribution, enhanced controlability of droplets' trajectories and lower power consumption. The numerical study is conducted concurrently to an experimental investigation to facilitate the validation and deliver feedback for further development. The atomizer includes a pin electrode that is placed at the center of a converging chamber. The chamber orifice is located at a known distance from the electrode tip. The pin electrode is connected to a high voltage that leads to the charging of the liquid. In the present work, the theoretical foundations of separated treatment of the polarized layer and the electronuetral bulk flow are set by describing the governing equations, relevant boundary conditions and the matching condition between these two domains. The resulting split domains are solved numerically to find the distribution of velocity and electrostatic fields over the specified regions.

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