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Evolution and dynamics of charged aerosols in plasmas[1] DECLAN DIVER, EUAN BENNET, HUGH POTTS, University of Glasgow, CHARLES MAHONY, PAUL MAGUIRE, DAVIDE MARIOTTI, University of Ulster — Understanding the evolutionary processes governing the dynamics and stability of charged macroscopic droplets in a discharge plasma is a central component of an innovative collaborative project on bacteria detection. Aerosolized bacteria samples will be injected into a discharge to acquire significant electrical charge. Two key aspects are then core to research: (i) the fluid stability of the charged aerosols under evaporative stress, and (ii) the stochastic component of their motion. (i) Initially stable charged aerosols subject to evaporation (continuously changing radius) may encounter the Rayleigh limit governing the maximum charge QR as a function of radius, arising from the electrostatic and surface tension forces. Additionally, the maximum surface field before charge emission QE can impose further constraints. (ii) A droplet is in any event subject to Brownian motion just like any other small particle, buffeted by a mixture of (dominant) neutrals and plasma, with the latter forming a sheath around the particle. The Brownian motion induced forces the sheath around the grain to move, incurring changes in impacting ion flux that can represent an additional drag term, changing the classical Brownian diffusion. We present analysis for a variety of discharge conditions.

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Declan Diver
University of Glasgow

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