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Precision charging of microparticles in plasma via the Rayleigh instability for evaporating charged liquid droplets[1] EUAN BENNET, University of Glasgow, CHARLES M.O. MAHONY, Ulster University, HUGH E. POTTS, PAUL EVEREST, University of Glasgow, DAVID RUTHERFORD, SADEGH ASKARI, COLIN KELSEY, FATIMA PEREZ-MARTIN, NEIL HAMILTON, DAVID A. MCDOWELL, DAVIDE MARIOTTI, PAUL MAGUIRE, Ulster University, DECLAN A. DIVER, University of Glasgow — In this paper we describe a novel method for delivering a precise, known amount of electric charge to a micron-sized solid target. Aerosolised microparticles passed through a plasma discharge will acquire significant electric charge. The fluid stability under evaporative stress is a key aspect that is core to the research. Initially stable charged aerosols subject to evaporation (i.e. a continually changing radius) may encounter the Rayleigh stability limit. This limit arises from the electrostatic and surface tension forces and determines the maximum charge a stable droplet can retain, as a function of radius. We demonstrate that even if the droplet charge is initially much less than the Rayleigh limit, the stability limit will be encountered as the droplet evaporates. The instability emission mechanism is strongly linked to the final charge deposited on the target, providing a mechanism that can be used to ensure a predictable charge deposit on a known encapsulated microparticle.

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