Abstract Submitted
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Non-thermal equilibrium plasma-liquid interactions with femtolitre droplets[1] PAUL MAGUIRE, CHARLES MAHONY, ANDREW BINGHAM, JENISH PATEL, DAVID RUTHERFORD, DAVID MCDOWELL, DAVIDE MARIOTTI, University of Ulster, EUAN BENNET, HUGH POTTS, DECLAN DIVER, University of Glasgow — Plasma-induced non-equilibrium liquid chemistry is little understood. It depends on a complex interplay of interface and near surface processes, many involving energy-dependent electron-induced reactions and the transport of transient species such as hydrated electrons [1]. Femtolitre liquid droplets, with an ultra-high ratio of surface area to volume, were transported through a low-temperature atmospheric pressure RF microplasma with transit times of 1 – 10 ms. Under a range of plasma operating conditions, we observe a number of non-equilibrium chemical processes that are dominated by energetic electron bombardment. Gas temperature and plasma parameters (ne $\sim 10^{13}$ cm^{-3}, T_e <4eV) were determined while size and droplet velocity profiles were obtained using a microscope coupled to a fast ICCD camera under low light conditions. Laminar mixed-phase droplet flow is achieved and the plasma is seen to significantly deplete only the slower, smaller droplet component due possibly to the interplay between evaporation, Rayleigh instabilities and charge emission [2].

[1] Mariotti et al., Plasma Process. Polym. 2012, 9, 1074–1085.
[2] E Bennet et al., New J. Physics (submitted).

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