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Continuous gas temperature measurement of cold plasma jets containing microdroplets, using a focussed spot IR sensor NOURHAN HENDAWY, HAROLD MCQUAID, DAVIDE MARIOTTI, PAUL MAGUIRE, Ulster University — Controlling gas temperature in real time via continuous monitoring is essential in various plasma applications especially for biomedical treatments and nanomaterial synthesis. Traditional techniques have limitations due to low accuracy, high cost or experimental complexity. Adding droplets to plasmas offers the possibility of enhanced delivery of plasma activated water but has the potential to destabilise the plasma and increase gas temperature. We demonstrate continuous high-accuracy gas temperature measurements of droplet-laden low-temperature plasma jets using a small focal spot infrared sensor directed at the outer quartz wall of the plasma. Heat transfer across the capillary tube was determined using calibration measurements of the inner wall temperature. Measured gas temperatures, without droplets, varied from 25 ^{o}C – 50 ^{o}C, increasing with absorbed power and decreased gas flow. The introduction into the plasma of a stream of microdroplets (˜12 um diameter) led to a reduction in gas temperature of ˜10 ^{o}C, for the same absorbed power. This is an important parameter in determining droplet evaporation and its impact on plasma chemistry.

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