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Diagnostic based Modelling for Determination of Absolute Atomic Oxygen Densities in Cold Atmospheric Pressure Plasmas STEPHAN REUTER, KARI NIEMI, LUCY M. GRAHAM, JOCHEN WASKOENIG, TIMO GANS, Queen's University Belfast — The present study introduces a novel diagnostic technique for the determination of absolute atomic oxygen densities in rf atmospheric pressure plasmas, which combines easy to apply optical emission spectroscopy (OES) with a relatively simple 1D numerical simulation. Atomic oxygen ground state densities are determined from the intensity ratio of the lambda = 750.4 nm argon and the lambda = 844 nm atomic oxygen line. The effective excitation rate coefficients k_e^* of the upper $Ar(2p^1)$ and $O(3p^3P)$ states, adequately describing the time and space integrated optical emission measurements, are calculated on basis of the time and space averaged EEDF from the numerical simulation. The method is applied on a low temperature rf-driven atmospheric pressure plasma jet operated in helium with small admixtures of oxygen and argon. The results were confirmed by reliable independent two-photon laser-induced fluorescence measurements.

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