Abstract Submitted
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Combining advanced optical diagnostics and simulations to reveal chemical kinetics in atmospheric pressure plasmas[1] SANDRA SCHROETER, J. BREDIN, A. R. GIBSON, A. WEST, A. WIJAIKHUM, K. NIEMI, H. DAVIES, N. MINESI, J. DEDRICK, University of York, M. FOUCHER, J. P. BOOTH, LPP, Ecole Polytechnique-CNRS, N. DE OLIVEIRA, D. JOYEUX, L. NAHON, Synchrotron SOLEIL, Y. GORBANEV, V. CHECHIK, E. WAGENAARS, T. GANS, D. O'CONNELL, University of York — Atmospheric pressure plasmas (APPs) are effective sources of reactive species (RS) and offer great potential for various applications, such as in biomedicine. Experimental quantification of RS is challenging in APPs due to their small dimensions and fast collisional deexcitation of excited states, requiring diagnostics with high temporal and spatial resolution. Plasma simulations give information about species densities and formation, but their accuracy depends on assumed reactions and rate coefficients, meaning that a benchmark against experimental measurements is desirable. Here, experimental and numerical approaches are combined to investigate RS production in rf APPs produced in a helium-water gas mixture. Absolute densities of O, H, OH, and H_2O_2 are measured using advanced optical diagnostics including VUV-VIS Absorption Spectroscopy in the liquid and gas phase, and picosecond Two-photon Absorption Laser-Induced Fluorescence, which are able to overcome the above-mentioned challenges. The successful benchmark of densities against a zero-dimensional plasma chemistry model allows for detailed investigation of formation pathways and identification of tailoring strategies based on varying gas composition and reactor design.

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