Microplasmas for the direct synthesis of Hydrogen Peroxide in the gas phase

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In this work, hydrogen peroxide (H_2O_2) is generated in a plasma to be used for the direct epoxidation of propene to propene oxide, a major bulk material in the chemical industry. Microplasmas especially for explosive mixtures of H_2/O_2 could be advantageous concerning safety and improve the overall cost-effectiveness of the production process. We aim to design an efficient and stable low temperature gas discharge using either water or hydrogen oxygen mixtures (potentially with added inert gases) for producing hydrogen peroxide. H_2O_2 easily dissociates thermally and thus it is essential to work close to room temperature. Various groups have already successfully used electrical discharges for producing hydrogen peroxide, however mostly in a liquid environment.

We compare the H_2O_2 production in a dielectric barrier discharge (DBD) and a parallel plate capacitive coupled RF discharge, both operating at ambient pressures and close to room temperatures. In lack of a thorough and consistent model for a humid gas discharge we are developing a model for the chemical kinetics of a humid discharge in order understand the production process and to maximize H_2O_2 yield as well as estimating operational parameters of the discharge. The product yield will be determined by spectrophotometric measurements of the reaction compounds of H_2O_2 after dissolving the gas flow in water.