Abstract Submitted
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The Role of Vibrational Energy on the Catalytic Production of Ammonia in Non-Equilibrium Atmospheric-Pressure Plasma[1] FRANCISCO HERRERA, PAUL RUMBACH, PATRICK BARBOUN, JONGSIK KIM, JASON HICKS, DAVID GO, University of Notre Dame — Plasma-catalytic nitrogen fixation to produce ammonia from nitrogen and hydrogen feedstock has been investigated as a potential alternative to the conventional Haber-Bosch process because it can be operated under less extreme conditions and potentially more energy efficiently. However, the fundamental mechanisms behind this process are not fully understood. In this work, we use optical emission spectroscopy (OES), which is a non-invasive technique for estimating relative relevant parameters of the plasma, to correlate plasma behavior with measured nitrogen conversion in a plasma-catalytic reactor. Using OES, we have performed several measurements of nitrogen-hydrogen atmospheric pressure dielectric barrier discharges (DBD) at different controlled operational conditions. We extract the vibrational and rotational temperatures of the DBD by comparing our spectroscopic measurements with a modelled optical emission. We find that the vibrational temperature is strongly dependent on the gas composition and power, and we correlate this behavior to measurements of nitrogen conversion using the same DBDs in conjunction with oxide-supported metal catalysts.

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