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Preliminary Characterization of a Coaxial DBD Plasma-Catalytic Converter for Methane Partial Oxidation[1] SYLVAIN COULOMBE, PABLO DIAZ GOMEZ MAQUEO, MATHEW EVANS, FLORENT SAINCT, JEFF BERGTHORSON, McGill Univ — This contribution discusses the development and characteristics of a coaxial dielectric barrier discharge (DBD) using a methane-oxygen mixture at atmospheric conditions of temperature and pressure. A sinusoidal voltage waveform of 12 kVp-p at 20 kHz produces discharges in a 1.15 mm gap. Power is estimated using a Lissajous figure method while optical emission spectroscopy (OES) is used to estimate the rotational and vibrational temperatures of the gas. Obtained OES spectra are similar, differing mainly on the intensity of their CH and OH bands, tending towards a more intense OH band as oxygen availability increased. CH bands show the strongest emission intensities of which, CH(C-X) seems to be the most intense of all, followed by CH(A-X) and lastly by CH(B-X). The spectra of CH(A-X) and CH(C-X) were uploaded into a simulation software to estimate the plasma temperatures. For the CH(A-X) bands, a simulation with a Trot = 600 K and a Tvib = 6000 K matched the experimental spectra. In the case of the CH(C-X) band, a Trot = 800 K and a Tvib = 4000 K were determined. The vibrational temperatures are especially high, a result which is particularly important for the development of a plasma-catalysis reactor.

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