Abstract Submitted
for the GEC20 Meeting of
The American Physical Society

Machine learning and optical emission spectroscopy TAHEREH MANSOURI[1], PAUL MAGUIRE, Ulster University — Applying machine learning to plasma spectra has potential to expand access to plasma conditions as well as applications in e.g. gas sensors or clinical breath analysis. We have recently demonstrated CH_4 detection at 1 ppm using a He low-temperature RF plasma jet and low-cost spectrometer. This identification occurs without dependence on carbon-based spectral lines. However, the high number of data variables (wavelengths) poses a severe challenge for machine learning and to progress to fully realistic gas environments requires greater understanding of the relationship between plasma, spectral features and model development. To this end we investigate the PLS-DA algorithm family which can provide feedback as to the significance of particular variables to a model's success or failure. Here we report models capable of differentiating different molecular species (CH_4, H_2 and C_2H_2) down to 1ppm. We use the Variable Importance on Projection (VIP) scores as a primary feature reduction technique to select the most influential wavelengths, which include mainly the major lines (He, H_x) as well as impurity lines with C_xH_y species having limited effect.

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Date submitted: 08 Sep 2020 Electronic form version 1.4