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Measured Current Distribution Functions Describing an Array of High Voltage Needles Operating In the Avalanche and Streamer Modes
ERIK WEMLINGER, PATRICK PEDROW, MANUEL GARCIA-PEREZ, SU HA, OSCAR MARIN-FLORES, MARVIN PITTS, Washington State University — It is hypothesized that cold plasma processing of small oxygenated molecules present in bio-oil will reduce coking in a catalytic steam reformer. The cold plasma reactor will be placed upstream of the reformer and will consist of an array of needles held at a DC voltage in the 5-10 kV range. The distribution of current pulses on each needle will be measured for gas mixtures consisting of varying amounts of argon, water, methanol, oxygen, and carbon dioxide. The small oxygenated hydrocarbon molecules from bio-oil can be reduced to hydrogen and synthesis gas by the catalytic steam reformer. However, the steam reforming of these oxygenated hydrocarbon molecules has a high tendency of coke formation. In this work, catalyst coking will be reduced by integrating the atmospheric pressure cold plasma reactor. Studying how distribution functions for elements in a small array (< 10 needles) "interact" will facilitate design of larger needle arrays that can be used for the commercial processing of biofuels.

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