Contribution ID: **1152** Type: **Poster**

3P07 - Electrical Discharge in Gas-liquid Mixture: Breakdown Voltage and Energy Deposition Distribution in Each Phase

Wednesday 26 June 2019 13:30 (1h 30m)

Pulsed electrical discharge was generated in a spark gap submerged in mineral oil with methane injected into the gap at ambient pressure. Spark gap was powered by a DC power supply (50 kV) with one resistor and one capacitor (30 pF). Breakdown occurs when the applied voltage reached the breakdown voltage of the mixture in the gap. Total breakdown voltage in the spark gap was predicted by studying breakdown in each phase and linearly combining them. Breakdown in gas phase with high pd values in the range of 200-1000 Torr-cm follows the Meek criterion. Liquid phase breakdown primarily depends on its dielectric strength close to 150 MV/m. One offset parameter f in the range of 0-1 was used to account for effects of impurities, electrode geometry and electrode surface area to estimate liquid breakdown voltage. Discharge energy deposition into two phases was also estimated based on predicted breakdown voltage. Breakdown voltages were studied experimentally as a function of gap distance and gas flow rate. Results showed that Meek criterion was able to accurately predict the breakdown voltage in gas phase as gap distance changes between 1-10 mm. Breakdown voltage in mixture at each flow rate increased when gap distance became larger. But breakdown voltage dependence on gas flow rate with constant gap distance showed more complex behavior: it dropped first with increasing gas flow rates, then increased as gas flow rates increased further. Discharge energy E was not evenly deposited into gas phase and liquid phase for all conditions. Changing gas flow rate and gap distance also changed the discharge energy distribution in each phase.

Authors: Mr WANG, KUNPENG (Texas A&M University); Dr STAACK, David (Texas A&M University)

Presenter: Mr WANG, KUNPENG (Texas A&M University)

Session Classification: Poster - Industrial/Commercial/Medical Applications and Plasma and Pulse Power Diagnostics

Track Classification: 6.1 Nonequilibrium Plasma Applications