Seminar

Institute for Plasma Research

Title : Compact pulsed power using liquid dielectrics

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Date : 11th March 2015, Wednesday

Time : 10.00 AM

Venue : Committee Room: 4, New Building, IPR

Abstract:

In the recent past, the demands for pulsed power machines have increased to number of applications. Many such applications require compact and low weight pulsed power systems with high voltage output (>100 kV). The portability and compactness of pulsed power systems can be accomplish by using dielectric medium with high dielectric constant and good breakdown strength. In comparison with solid dielectrics, liquids and gases are self-healing. High dielectric constant and good breakdown strength make liquids more suitable for energy storage and as switch media compared to compressed gases, particularly for nanosecond pulse generators. Proper understanding of the breakdown properties of dielectrics will lead to improve the dielectric strength. Despite extensive research and theoretical studies, the understandings of electrical breakdown properties of liquids (like water) are far from complete.

In this work, an effort has been made to understand the electrical breakdown properties of water under nano second regime with the help of Tesla based pulse generator. Experiments have been carried out by applying tens of nano second pulses and hundreds of kilo volts under uniform field conditions. The parametric effect like, effect of electrode material (Brass and Stainless steel), applied voltage polarity and change in distance between the electrodes on water breakdown properties have been studied. In addition, a comparative study of electrical breakdown properties of deionized water (H_2O) and heavy water (D_2O) is presented with two different electrode materials (SS and Brass), and polarity (positive, negative) combinations. Breakdown profiles of both the samples are obtained using voltage and current sensors. Further, an interpretation of the observations is attempted using optical diagnostics i.e., emission and absorption spectroscopy.