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Charging Effects of High Voltage Probe Pulse on Pulsed Electroacoustic Measurements*

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Abstract

Under certain circumstances, charging near the sample-electrode interface is seen with Pulsed Electroacoustic (PEA) measurements. The effects of the amplitude, width, and repetition rate of the pulsed high voltage probe, with and without the presence of a high voltage DC bias, on the presence and magnitude of charge build up in the sample are studied. PEA measurements are arguably the most promising of several methods to measure spatial distributions and time evolution of embedded charge. The PEA method works by applying an electric field to a charged layer within a dielectric with a pulsed high voltage probe. This produces a force on the embedded charge, creating a pressure wave that can then be detected by a piezoelectric transducer. Measurements of spatial distributions of charge within polymethylmethacrylate (PMMA) were acquired using PEA measurements. Measurements of 250 µm thick sheets of PMMA using pulsed voltages with 5 Hz repetition rate, varying between 0.5 – 5 ns pulse width and 1000 – 2000 V pulse amplitude with and without 8 kV high voltage DC biasing (~30 kV/mm) were shown to affect charging at the interfaces.

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