Abstract Submitted
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Pulsed Electro-Acoustic Measurements of Charging and Relaxation in Low Density Polyethylene[1] ZACHARY GIBSON, Material Physics Group, Utah State University, LEE PEARSON, ERICK GRIFFITHS, ANTHONY PEARSON, Box Elder Innovations, LLC, JR DENNISON, Material Physics Group, Utah State University — A Pulsed Electro-Acoustic (PEA) system was developed and used to study electron charge injection, transport, and relaxation in Low Density Polyethylene (LDPE). Measurements of the time evolution of the charge profiles using the BEI/USU PEA system are compared to predicted models and to previous studies; these are used to verify that the new system is working as expected and to characterize the system's resolution and capabilities. The measurements were made by placing 125 μm thick LDPE between two electrodes in a parallel plate configuration. Charge was injected via electrode charging for ˜30 min with a ˜40 MV/m applied field and then allowed to discharge with no applied field for ˜30 min. The distribution of charge in the dielectric was measured with PEA by applying a ˜100 MHz ˜850 V electric pulse to displace the embedded charge, causing an acoustic pulse monitored via time-of-flight with a thin piezoelectric sensor allowing observation of charge accumulation and dissipation. Higher spatial resolution nondestructive PEA measurements of embedded charge in dielectrics offer important information for applications such as spacecraft charging, plasma deposition, accelerator physics, high voltage devices and transmission lines, supercapacitors, microelectronics, and nanodielectric materials.

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