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Structural and Interfacial Effects on the Dielectric Properties of PVDF and its Composites for Energy Storage JENNIFER JONES, Vanderbilt University, ANTHONY MAYO, Fisk University, LEI ZHU, Case Western Reserve University, NORMAN TOLK, Vanderbilt University, RICHARD MU, Fisk University — High energy density capacitors based on dielectric polymers are a focus of increasing research effort motivated by the possibility to realize compact and flexible energy storage devices. Multilayered ferroelectric polyvinylidene fluoride (PVDF) systems are fabricated using enabling technology in co-extrusion for increased energy storage efficiency. These micro- and nano-layered polymeric systems result in much improved device performance and a three-time enhancement of capacitive electrical energy density has been demonstrated. PVDF thin film nanocomposites with ZnO nanofillers have also been fabricated and evaluated for further enhancement of energy density storage. To understand the physics of why these multilayered and nanocomposite systems perform better than single layer PVDF we are developing characterization techniques using confocal second harmonic generation (SHG), electric field induced second harmonic (EFISH) and Raman laser spectroscopy. Our results have shown that the combination of Raman and SHG is a very sensitive, non-destructive and versatile technique that can be used to study the ferroelectric and structural properties of these systems. The addition of the EFISH technique allows the interrogation of structural and dielectric properties within individual layers and at the interfaces.

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