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PVDF:TiO_2 Composite Thin Films for Capacitive Energy Storage CRYSTAL EWEN, RANDY DILLINGHAM, TERRY STUFFLEBEAM, ERIC BRICKLEY, Northern Arizona University — Thin films composed of the polymer polyvinylidene fluoride (PVDF) and the ceramic nanoparticle titanium dioxide (TiO_2) are fabricated via thermal vapor deposition. This combination is ideal since it is light weight and improves the energy density. The elemental composition of the films are determined with energy dispersive x-ray spectroscopy using a scanning electron microscope. Elemental mapping of the films shows that the polymer and nanoparticles are homogeneously distributed. The ideal initial concentrations of PVDF and TiO_2 were determined to be 83% and 17% respectively. The final films yield a Ti weight percent of 20. Parallel plate capacitors were fabricated by combining thermal vapor deposition and sputter coating. For the electrodes the parallel plates are gold-palladium (AuPd) with PVDF:TiO_2 as the dielectric. The AuPd electrodes were deposited via sputter coating. Each electrode was sputtered for 100s, which yields a thickness of 33nm. Current research is working to improve the amount of Ti deposited by varying the temperature and deposition time, obtain more accurate thickness measurements, and improve on its electrical properties.

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