

**EFFECTS OF A COMBINED SUPERCRITICAL
EXTRACTION/THERMAL CYCLE ON BINDER REMOVAL CYCLE
TIME, YIELD, RESIDUAL CARBON, AND DEFECT FORMATION IN
MULTILAYER CERAMIC CAPACITORS**

Brandon D. Abeln

Dr. Stephen J. Lombardo

Thesis Supervisor

ABSTRACT

In this work, a combined cycle consisting of a supercritical extraction cycle (SCE) followed by a thermal cycle (TC), was used to remove binder from green multilayer ceramic capacitors. The dielectric was barium titanate and the binder consisted of poly(vinyl butyral) plasticized with phthalates. Supercritical extraction of approximately one-third of the binder leads to an increase in the porosity and gas permeability of samples and to a decrease in the adhesion strength between layers. The partial removal of the binder also resulted in a decrease in cycle time and defects following the combined SCE/TC. Samples subjected to the combined SCE/TC also had 25-30% less residual carbon as compared to samples subjected to a thermal cycle alone. This work also presents the binder removal efficiencies from tape cast films fabricated with titanate-based dielectrics. The organic systems evaluated were plasticized acrylic, poly(propylene carbonate), and poly(vinyl butyral) binders. The effect of temperature on binder removal and defect formation are assessed.