

Public Abstract

First Name: Jason

Middle Name: Andrew

Last Name: Smith

Adviser's First Name: Randy

Adviser's Last Name: Curry

Co-Adviser's First Name:

Co-Adviser's Last Name:

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Department: Electrical Engineering

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Title: DEVELOPMENT OF NEW DIELECTRIC MATERIALS FOR PULSED POWER APPLICATIONS

This study looks at the development of new dielectrics, which blend characteristic of different materials for use in high voltage capacitors and antennas. As new needs arise in electrical engineering including pulsed power and directed energy, new materials are needed reduce the size and cost of electrical assemblies. This study investigates new composite dielectrics made of mixes of two different ceramic nanopowders in a matrix of two different melted thermoplastics. The intent of this study is to blend the high dielectric constant of ceramic nanopowder with the high dielectric strength and the mechanical qualities of a thermoplastic. The measured dielectric strength and the dielectric constant of the composite material is reported and compared to commercial plastics.

The result is the development of a new dielectric material with a dielectric constant that is higher than most thermoplastics while still displaying good mechanical properties. The results also show that a major challenge of developing a successful composite is obtaining an adequate level of mixing between the two phases of the material. This study is a starting point from which new dielectric materials can be developed that could impact a wide range of electrical engineering disciplines.