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Title: Partnership Opportunity: Nanoparticle-based Barium Titanate (BTO) Ceramic Capacitors

NAICS Code: 33416-Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing

Classification Code: A-Research and Development

Background Information:

Sandia National Laboratories (Sandia) has made an initial investment in the research and development of barium titanate (BTO) nanoparticles for use in improved ceramic ferroelectric capacitors. Such investment includes a non-provisional patent application surrounding a unique BTO nanoparticle synthesis methodology. Current areas of interest also include the fabrication and testing of 100% ceramic and ceramic/polymer composite devices. Sandia is a world leader in ferroelectric materials synthesis and device fabrication.

BTO nanoparticle precursors offer significant technical benefits including a reduction of sintering temperature and improved material homogeneity. These benefits directly correlate to improved ferroelectric device performance by means of increased breakdown strength, decreased strain, enhanced permittivity, decreased voltage coefficient of capacitance and decreased temperature coefficient of capacitance. The reduced sintering temperature and improved device performance achieved using nanoparticle precursors will translate to a substantial decrease in device manufacturing costs.

Opportunity Description:

Sandia is seeking a Cooperative Research and Development Agreement (CRADA) with an industrial partner interested in the demonstration and deployment of this technology.

Sandia invites interested parties to provide a detailed description of relevant background, experience, expertise and capabilities that could be utilized in a collaborative partnership with Sandia.

Interested companies are preferred but not required to have experience and expertise in one or more of the following areas:

- 1) Synthesis of nanomaterials in scales sufficient for commercial use
- 2) Fabrication and testing of multi-layer ceramic capacitors using conventional or innovative ceramic processing and sintering techniques
- 3) Fabrication and testing of inorganic/polymer composite capacitors

In addition, Sandia will evaluate responses and select prospective parties with which to engage in further discussions based on the following criteria, pursuant to Sandia's technology transfer mission:

- 1) What are the respondent's specific research and development, prototyping and deployment capabilities and resources relative to this technology?

- 2) How will the respondent deploy the technology for the benefit of the U.S. public good?
- 3) How will the respondent's deployment of the technology benefit U.S. economic competitiveness?

The ideal partner will be able to contribute a minimum of \$400K per year for two years towards the commercialization of this technology.

Interested parties that meet the criteria outlined above are invited to respond. Responses should be emailed to Todd Monson at tmonson@sandia.gov .

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Keywords: ferroelectric, ceramic, capacitor, nanomaterials, chemistry, sintering, inorganic, polymer, composite