

**Post for 60 days**

**Title:** Partnership Opportunity: Nanoparticle-Based Lead Zirconate Titanate (PZT) 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 lead zirconate titanate (PZT) nanoparticles for use in ceramic ferroelectric capacitors. Additional research and development is also being conducted on PZT device fabrication and testing.

PZT 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. It has been demonstrated that nanoparticulate PZT precursors can sinter at temperatures low enough to use silver/palladium alloy electrodes, rather than platinum electrodes, providing a device manufacturer with a 4-fold decrease in electrode (and therefore device) cost. Other benefits, such as reduced lead volatility, are achieved through such a substantial decrease in sintering temperature.

*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](mailto:tmonson@sandia.gov)

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