RUI: Magnetoelectric Effects in Multilayers of Magnetostrictive and Piezoelectric Perovskite Oxides

Gopalan Srinivasan, Oakland University, DMR-0072144

Magneto-electric (ME) materials facilitate the conversion of a magnetic field into an electric field. We studied the conversion efficiency of samples consisting of alternate layers of ferrites (that deform in a magnetic field) and lead zirconate titanate (that generate electricity when deformed). The layered samples are found to show excellent field conversion compared to bulk composites. Such novel artificial materials are useful for smart sensors, signal processing and memory devices.

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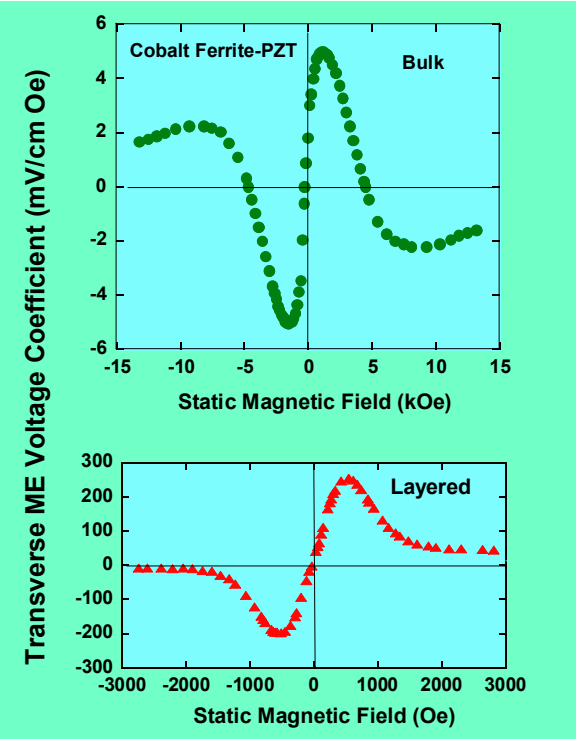

ME voltage coefficient versus static magnetic field in bulk and layered ferrite-PZT composites. Notice the two orders of magnitude higher coefficient for layered samples.

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Broader Impacts:

Education:

The program contributed significantly to the education and development of human resources at the undergraduate level. Undergraduate students: 9; Undergraduate degrees: 6; Visiting Scientists: 2 (Bichurin and Fetisov)

Publications and Presentations

Journal Publications: 20;Undergraduate coauthored publications: 12;
Conference Presentations: 15

Patents:

Two provisional patents filed in 2002. Formal patents filed in 2003.

Collaboration:

Academic: (European Scientist)

Established collaboration with European Scientists: Professors Bichurin (Novgorod, Russia); Fetisov (Moscow, Russia); Laletin (Belarus).

Industry: (Delphi Automotive)

The PI spent one-semester of sabbatical at the Delphi Research Laboratories. Ongoing joint projects involve sensors and devices based the composites.

Outreach:

Ranjini Srinivasan (senior, Rochester High School) spent a year on research projects. Reports were submitted to Siemens-Westinghouse and Intel science talent competitions.