



Landau energy of homogeneous system

Technology Summary

The subject invention covers a variety of relaxor-PT ferroelectric material systems that the Penn State inventors engineered by controlling the size and volume of polar nanoregions. The inventors also utilized certain dopants to tailor the high dielectric and electromechanical properties for specific applications and provide stability. For instance, one PMN-PT composition had an enhanced dielectric constant on the order of 10000-15000, which is three to five times (3-5X) those of pure counterparts and commercial PZT5H. Such characteristics are greatly beneficial for array transducer design and electrical impedance matching.

Application & Market Utility

Piezoelectric sensors and actuators require higher piezoelectric coefficients, such as $d_{33} > 1000$ pC/N. Medical imaging transducers are demanding high electromechanical coupling factors ($k_{33} > 0.8$), since bandwidth and sensitivity of transducers are closely associated with the coupling factor. Previous efforts focused on morphotropic phase boundary designs have had only limited success.

Next Steps

Further develop working prototypes of specific piezoelectric ceramic composition.

TECHNOLOGY READINESS LEVEL

4-7

Seeking

Investment | Licensing | Research

Keywords

- piezoelectric ceramics
- transducers and actuators
- sensors
- high piezoelectric coefficient
- high dielectric permittivity

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