



Development of Ferroelectric Crystal Materials Measurement of Ferroelectric Properties for Relaxor

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Research Fields Electronic Materials, Instrument Technology

Keywords Relaxor ferroelectrics, Piezoelectrics, permittivity

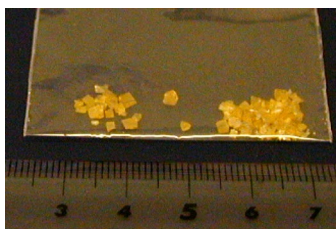
● Research Outline

Crystal Growth of Relaxor typed Ferroelectrics

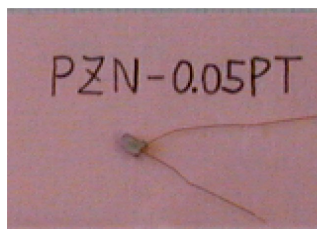
The ferroelectric materials are widely used as a key material of the electronic devices like a piezoelectric device, an ultrasonic transducer, or a FeRAM (ferroelectric random access memory), etc.. Relaxor typed ferroelectric crystals like $(1-x)\text{Pb}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3-x\text{PbTiO}_3$ (abbr. $(1-x)\text{PZN-xPT}$) are grown with PbO flux by the flux method in electric furnace. The photograph below shows 0.95PZN-0.05PT single crystals grown in this method.



Electric Furnace



0.95PZN-0.05PT
single crystals



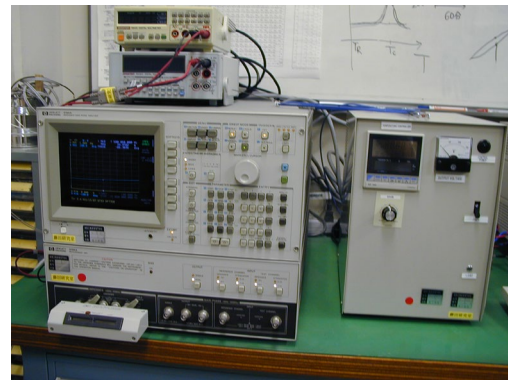
Capacitor sample



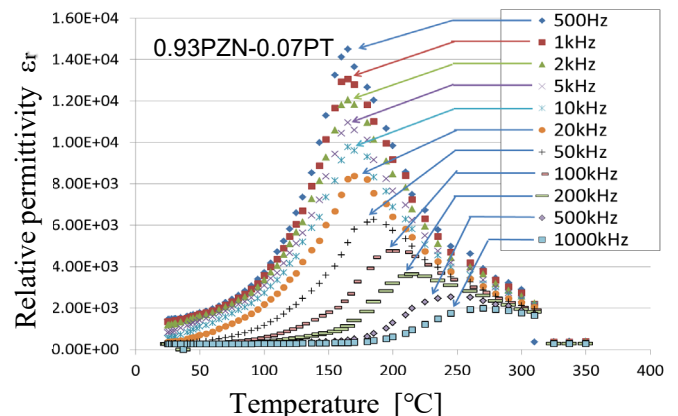
Magnetron Sputter

Measurement of the Ferroelectric properties and Piezoelectric properties for the ferroelectric materials

$(1-x)\text{PZN-xPT}$ crystals are polished using lapping paper, shaped to the thin plate. After that, the electrodes are sputtered on the both sides of $(1-x)\text{PZN-xPT}$ plate. The $(1-x)\text{PZN-xPT}$ sample are formed into the capacitor. Using an impedance analyzer (HP4194A) and thermostatic furnace, the temperature dependence of the permittivity of the $(1-x)\text{PZN-xPT}$ material is measured. The temperature dependence of the permittivity for 0.93PZN-0.07PT crystal in cooling process is shown in the following figure.



Impedance Analyzer



Temperature dependence of permittivity
for 0.93 PZN-0.07PT