



Prof. **Takaaki Tsurumi**
 Graduate School of Science and Engineering
 Department of Metallurgy
 and Ceramics Science

Contact: Tel./Fax: 03-5734-2517; ttsurumi@ceram.titech.ac.jp
 Lab HP: <http://www.cim.ceram.titech.ac.jp/>

Research field: Dielectrics and Ferroelectrics

Research topics conducted within the G-COE project

1. Electro-optic Effect of Ferroelectrics Thin Films

A small optical modulator is a key devices to realize high-speed optical communication in home and offices in the next generation. This research is conducting to develop small optical modulators using electro-optic effect of ferroelectric thin films. Electro-optic effect of barium strontium titanate films will be evaluated by mean of newly developed ellipsometer system shown in Fig. 1. The relation between the frequency dependence of electro-optic coefficients and that of dielectric permittivity is an important topic for basic material science. Beased on these results, we are going to develop a small optical modulator with good performance above 10 GHz.



Fig. 1 Ellipsometer system used for the electro-optic measurement.

2. Shear-mode Ultrasonic Motors Using Lead-free Piezoelectric Ceramics

Usage of lead containing piezoelectric ceramics will be restricted in the future because of the toxicity of lead. We have focusing on the high piezoelectric activity in alkaline niobate based ceramics and have recently succeeded in developing new ceramics with performance comparable to PZT. This research is conducting to develop ultrasonic motors driven by the shear-mode piezoelectricity of the ceramics. The structure and the result of FEM simulation of the motor is shown in Figs. 2 and 3, respectively.

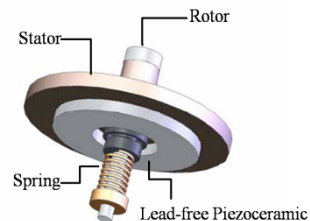


Fig. 2 Structure of ultrasonic motor.

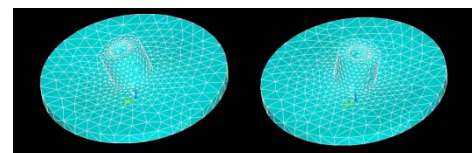


Fig. 2 Rotation of the motor in a FEM simulation.

Representative publications

T. Tsurumi *et al.*, "Ultra-Wide Range Dielectric Spectroscopy of BaTiO₃-based Perovskite Dielectrics," Appl. Phys. Lett., in print.
 E. Li *et al.*, "Effect of Cu and Li Substitution on the Piezoelectric Properties of Potassium Sodium Niobate Lead-free Ceramics", IEEE Trans. Ultrasonic, Ferroelectrics and Frequency Control, in print.