

PbTiO₃-based sol-gel composite ultrasonic transducers manufactured by automatic spray system

Kohei Hirakawa¹, Takumi Hara², Makiko Kobayashi³

¹ Department of Computer Science and Electrical Engineering, Kumamoto University, Japan, ¹Department of Graduate School of Science and Technology, Kumamoto University, Japan, ¹Faculty of Advanced Science and Technology, Kumamoto University, Japan

PbTiO₃(PT)/Pb(Zr,Ti)O₃(PZT) prepared by the manual spray method showed equivalent sensitivity at room temperature and sensitivity over it at high temperature in comparison with PZT/PZT. However, at room temperature, polarization is difficult to occur due to high coercive fields, and it has a problem that practical operation is difficult while having excellent sensitivity. In this study, PT/PZT was prepared by the automatic spray method, and the performance comparison with PZT/PZT was carried out. In the experiment, PT powder and PZT sol-gel solution appropriately mixed in the Low heat capacity and highly heat-resistant titanium substrates of 30mm in length, 30mm in width and 3mm in thickness are sprayed. The automatic spray method has the advantages that mass production is possible, film quality is improved on average, and reproducibility is easily obtained. Polarization is performed by corona discharge after film formation to compare ultrasonic performance. In a previous study, TiO₂, a high resistivity sol-gel solution using Bi₄Ti₃O₁₂ powder, was efficiently polarized at room temperature. Therefore, when TiO₂ is used as a sol-gel solution, the PT powder is expected to be efficiently polarized at room temperature. In this experiment, the combination with sol-gel solution such as TiO₂ will be test in order to investigate the possibility of room temperature polarization.