

Pulse voltage direction and CaBi₂Ta₂O₉(CBTa)/Bi₄Ti₃O₁₂(BiT) ultrasonic performance

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Sol-gel composite piezoelectric films are made from sol-gel solutions and piezoelectric powders, and may be used in various devices such as ultrasonic transducers and biological signals. In sol-gel composites, poling is an extremely important process for providing piezoelectricity. The conventional poling process, in which direct voltage is applied directly, is time consuming and can cause dielectric breakdown during poling due to vacancies in the composite film. In this experiment, poling was performed on CaBi₂Ta₂O₉(CBTa)/Bi₄Ti₃O₁₂(BiT) by using a pulse voltage source to prevent dielectric breakdown, to perform poling in a short time, and to improve reproducibility. Samples are generally dense and can be broken by applying a negative voltage. However, the sample in this study is very porous, so it can be considered that there is no problem because it can shrink firmly even if poling in the shrinking direction. In addition, other materials such as Pb(Zr,Ti)O₃(PZT) have better performance for samples poling with a negative pulse voltage. Therefore, tried to apply a negative voltage to CBTa/BiT, but could not poling it. This is probably because CBTa requires poling at high temperature, but ozone became unstable at high temperature and poling was not possible. Therefore, we tried to reverse the direction of the applied voltage. At this time, the heat resistance improved.