

Investigation of optimum preparation condition for (Bi_{0.5}Na_{0.5})TiO₃-hexagonal BaTiO₃ using electrophoretic deposition (EPD) Method

Interdisciplinary Graduate School of Medicine and Engineering, University of Yamanashi¹,

Nano Ceramics Center, National Institute for Materials Science²

Min Su Kim¹, Ryo Itou¹, Tohru S. Suzuki², Tetsuo Uchikoshi², Satoshi Wada¹

E-mail: swada@yamanashi.ac.jp

(Bi_{0.5}Na_{0.5})TiO₃-BaTiO₃ (BNT-BT) ceramics are well-known candidate for lead-free piezoelectric materials, because of their high Curie temperature. Among them, it is reported that Curie temperature of 85BNT-15BT composition is more than 200 °C without depolarization temperature (T_d).

To obtain good properties of piezoelectric ceramics, we have studied to prepare fine-grained and [111]-textured ceramics. To achieve fine-grained and [111] textured ceramics, we investigated high magnetic field-electrophoretic deposition (HM-EPD) method which uses magnetic alignment to make textured ceramics as shown fig. 1. To enhance magnetic alignment, we use hexagonal BaTiO₃ in BNT-BT system because of its high crystal anisotropy ($c/a \sim 2.44$).

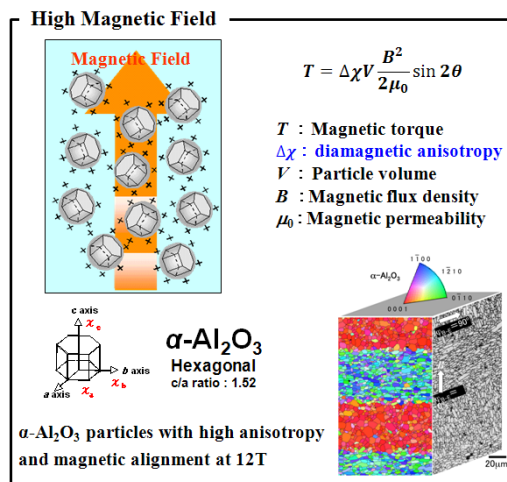


Fig 1. Principle for magnetic alignment of diamagnetic particles.

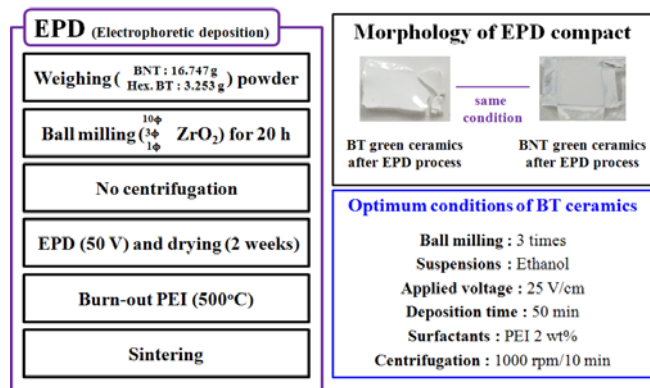


Fig 2. Optimum condition for preparation of BaTiO₃ ceramic with EPD method

In this work, we tried to find optimum preparation condition of 85BNT-15BT ceramics using EPD method with hexagonal BT powders, investigating various conditions for the ball milling, the suspensions, centrifugation and the deposition time. After that, we evaluated various properties of the prepared ceramics.