

INVESTIGATION OF AFFECTING PARAMETERS OF ELECTROPHORETIC DEPOSITION (EPD) METHOD IN $(\text{Bi}_{0.5}\text{Na}_{0.5})\text{TiO}_3$ -HEXAGONAL BaTiO_3 AND THEIR PROPERTIES

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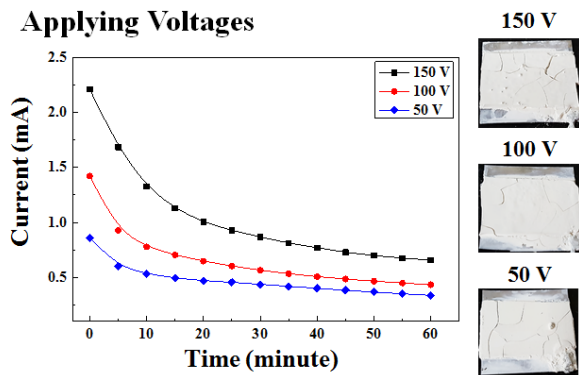
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Nowadays, eco-friendly materials have been attracting attention worldwide since the legislation of RoHS/WEEE directives in Europe. $(\text{Bi}_{0.5}\text{Na}_{0.5})\text{TiO}_3$ - BaTiO_3 (BNT-BT) systems are well known candidate of lead-free piezoelectric materials. However, BNT-BT systems have relatively low piezoelectric constant ($d_{33} \sim 140$ pC/N) which is difficult to apply in commercial products. In spite of this problem, BNT-BT systems have good potential because it is easy to apply mass production.

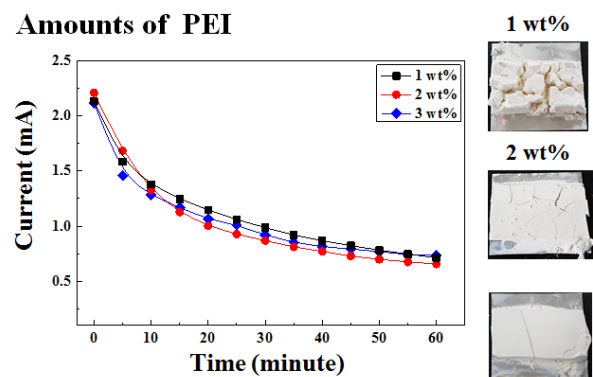
Electrophoretic deposition method (EPD) has good advantage in mass production because size and shape of green ceramics is easily controlled by control of electrode. Moreover, it is reported that EPD method can be fabricated textured ceramics using high magnetic field and texture technique is important in enhancing piezoelectric properties. Our final goal is making [111] oriented BNT-BT ceramics which have enhanced piezoelectric properties and appreciate for mass production.

To achieve our goals, we prepared BNT-BT ceramics without high magnetic field and investigated important factor of making BNT-BT ceramics using EPD method. In this work BNT-BT ceramics were fabricated with various conditions such as change the amount of polyethyleneimine (PEI), applying voltage and ball milling time. Figure 1 and Figure 2 shows BNT-BT ceramics fabricated by EPD and change the applying voltage and PEI conditions. We consider that these phenomena are originated from Na^+ ion dissolution and we could find optimum preparation condition with avoiding Na^+ dissolution. Finally, we compared with BNT-BT ceramics fabricated by conventional method and characterized piezoelectric and dielectric properties of both samples.



Voltage	PEI	Weight	Green Density
150 V	2 wt%	1.8362 g	55.6 %
100 V		1.4218 g	56.3 %
50 V		1.2423 g	55.8 %

Figure 1 – Properties of BNT-BT green ceramics fabricated by EPD method using various applied voltage.



Voltage	PEI	Weight	Green Density
150 V	1 wt%	1.8529 g	35.6 %
	2 wt%	1.8362 g	55.6 %
	3 wt%	1.9317 g	54.4 %

Figure 2 – Properties of BNT-BT green ceramics fabricated by EPD method using various PEI amounts