

ABSTRACT

A lead-free piezoelectric ceramic composition which includes a primary phase formed of an alkali niobate-based perovskite oxide represented by a compositional formula

5 $(A1_a M1_b)_c (Nb_{d1}, Mn_{d2}, M2_{d3}) O_{3+e}$ (in which element A1 represents at least one species among the alkali metals; element M1 represents at least one species among Ba, Ca, and Sr; element M2 represents at least one species of Ti and Zr; the following conditions: $0 < a < 1$, $0 < b < 1$, $a + b = 1$, $0.80 < c < 1.10$, $0 < d1 < 1$, $0 < d2 < 1$, $0 < d3 < 1$, and $d1 + d2 + d3 = 1$, are satisfied; and e represents a value showing the degree of deficiency or excess of oxygen) and which satisfies the

10 condition: $b/(d2 + d3) > 1.0$.

Figure 1