ABSTRACT

DOMAIN CONTROLLED PIEZOELECTRIC SINGLE CRYSTAL AND FABRICATION METHOD THEREFOR

Disclosed are a domain controlled piezoelectric single crystal which uses a lateral vibration mode (k_{31}) effectively using an electromechanical coupling factor k_{31} equal to or greater than 70% and a piezoelectric constant $-d_{31}$ equal to or greater than 1200 pC/N, with an electromechanical coupling factor k_{33} equal to or greater than 80% and a piezoelectric constant d_{33} equal to or greater than 800 pC/N, and a domain controlled piezoelectric single crystal which uses a highly efficient and high-performance longitudinal vibration mode (k_{33}) with k_{31} equal to or smaller than 30% and without a spurious or the like in the band that uses the k_{33} vibration mode. A step of applying a DC electric field of 400 V/mm to 1500 V/mm for a maximum of two hours in a temperature range of 20°C to 200°C as polarization conditions in the thickness direction of the piezoelectric single crystal or performing cooling while applying an electric field (field applied cooling) is carried out, or a step of applying an electric field in a direction perpendicular to the polarization direction is performed as a prestage of the first step recited, or a step of heating and cooling a piezoelectric single crystal material with a temperature at the boundary between a rhombohedral crystal and a tetragonal crystal of the piezoelectric single crystal or a temperature at the boundary between the tetragonal crystal and

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a cubic crystal in between is performed or a heating and cooling step is carried out between two different temperatures of a cubic crystal temperature range (heat treatment), or those steps are used together.

Fig. 1