PMN-PZT-Based Textured Ceramics and the Thickness Dependence (2025)

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Abstract

CTS Corporation has been producing T4001 textured ceramics based on a PMN-PZT solid solution for several years. d_{33} of a part as thin as 1mm is greater than 650 pC/N. However, the value decreases almost linearly with increasing thickness. This mystery has been recently explained to a certain degree through our investigation which reveals an inhomogeneity in our parts. We found that a non-negligible interaction takes place between the parts and the sintering atmosphere, including the powder bed and the cover wafer. We will show that this interaction, whose effects turn out to be lowering the depolarization temperature and therefore improves the d_{33} of our material, can impact the whole cross section of a very thin part but only the surface layer of a very thick one. Accordingly, the more pronounced inhomogeneity in a thicker part could be the reason for the observed thickness dependence of d_{33}. We believe that this phenomenon is unlikely just unique to our material. Any interactions that might occur throughout the firing process at both lab and manufacturing scale deserve awareness from all of us.

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