

9-4 Thermal Depoling of High Temperature Ferroelectric Ceramics

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Abstract: Some Aurivillius phase ferroelectrics are good candidates for high temperature piezoelectric application because of their high Curie points. Thermal depoling of ferroelectrics determines the upper temperature limit of their application as piezoelectrics. The orthorhombic structured even-layer compounds showed good resistance to thermal depoling up to temperatures close to their Curie points. However, the odd-layer compound, which has monoclinic structure, showed significant reduction in d_{33} well below its Curie point. The monoclinic distortion produces more non-180° ferroelectric domain structures, and it is the thermal instability of these that accounts for the thermal depoling behaviour. In both even- and odd-layer compounds, ceramics with small grain size show poor resistance to thermal depoling, but textured ceramics show greater resistance. The depolarisation is assisted by internal mechanical stresses. These stresses are higher in ceramics with small grain size and are smaller in textured materials, which explains the increasing resistance to thermal depoling with increasing grain size or texture.