

The impact of atmosphere condition during the sintering of (K,Na)NbO₃-based lead-free piezoelectric fibers

Joaquim Perrenoud

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The development of lead-free ceramics is attracting great interest due to growing environmental concerns. Interesting candidate are (K,Na)NbO₃ ceramics and its derivatives. In this study, fibers of doped potassium sodium niobate with specific composition (K_{0.44}Na_{0.52}Li_{0.04})(Nb_{0.86}Ta_{0.10}Sb_{0.04})O₃ are investigated. The sinterability of thermoplastic extruded fibers is analysed within different controlled atmospheres. Reducing conditions are achieved with a gas mixing furnace while other samples are sintered in a sealed volume where some Lead-free powder is added. The sintering dwell time varies from 2 to 16 hours. The ceramic fibers are then analysed in term of crystallinity with XRD, microstructure with SEM images and electromechanical properties. It was found that none of the tested conditions brings notable improvements on the piezoelectric properties. Almost every samples shows a high proportion of secondary phase that reduce these properties and the other samples shows a very high porosity.

Superviseur : Professeur Bernard Grobéty