



Abstract

Lead-free ceramics based on BNT-BT

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The development of Piezoceramics, which do not contain lead has been a main focus of universities and companies for at least the last two decades. This is mostly due to the laws implemented in the European Union to avoid certain substances, in this case lead, in the supply chain of electronic equipment and automotive applications. In contrast to certain other applications, lead is a main constituent of the piezoelectric materials based on Lead-Zirconate-Titanate (PZT) and one of the main reasons for the unique properties. Despite the quite large research, no real substitution has been found. The most promising materials are based on Potassium-Sodium-Niobate (KNN) and Bismuth-Sodium-Titanate-Barium-Titanate (BNT-BT). Still, the properties are inferior to PZT and the powder processing routes are mostly more expensive, which makes the production highly costintensive. The use of KNN is, according to recent investigations into the Lifecycle, not beneficial to the environment either.

But interestingly, some properties of lead free Piezoceramics differ quite strong from PZT in a way, which could be used in some applications. BNT-BT for example, has a very strong anisotropy between the planar and longitudinal effect. This could be exploited in applications which require strong thickness mode oscillation in combined with lower losses due to mechanical friction caused by planar mode oscillation. In this presentation the current state of the art for BNT-BT based ceramics will be presented. Comparisons are drawn with PZT and the next steps to generate more data on reliability and reproducibility of lead free materials from a production point of view will be discussed.

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