

High coupling piezoelectric thick film materials for MEMS-based energy harvesting devices

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ABSTRACT

InSensor® PZT (Lead Zirconate Titanate) thick film technology has been already successfully applied in various applications including medical imaging and MEMS acceleration sensors. The piezoelectric materials are deposited on Silicon substrates using screen printing technique. The PZT thick films are stable and exhibit very good piezoelectric properties.

The InSensor® PZT thick-film technology has been used to manufacture Si unimorphs. Standard TF2100 piezoelectric material as well as high pressure processed TF2100 films have been tested using the same geometry of the devices, allowing direct comparison of the performances. According to the obtained results the devices based on high pressure processing of the piezoelectric materials leads to an increase in energy density by a factor of 3.

The presented work has demonstrated that piezoelectric thick film technology can be successfully applied in the field of energy harvesting enabling fabrication of highly integrated devices with the superior performance. Moreover, the technology of screen printed piezoelectric thick films can also be applied to manufacture sensors (e.g. accelerometers) or/and actuators leading to fully integrated energy autonomous devices when combined with wireless communication.