

Flexible Lead-free Piezoelectric Composites for Energy Harvesting Applications

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Functional composites of electroceramic particles in a polymer matrix are valued for easy, low temperature processing and good mechanical properties. However, the piezoelectrical properties generally suffer due to limited connectivity of the electroceramic particles, especially at low ceramic volume fraction. Composites with enhanced properties compared to composites with randomly dispersed particles can be obtained by dielectrophoretic alignment of the particles during curing of the polymer matrix. Highly sensitive materials can be achieved by optimization of the filler material and matrix material. Highly flexible lead free piezoelectric composites have been developed on basis of potassium sodium lithium niobate (KLN) with silicone rubber. The piezoelectric properties of these structured 10 vol. % structured KLN-composites exceeds that of all values for such functional composites reported in the literature and is comparable to polymers based on PVDF. These materials show a good potential for use in energy harvesting systems. Furthermore, they show potential for sensing systems for large areas in the field of printed electronics.