Abstract Submitted
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Shear piezoelectric coefficients of PZT, $LiNbO_3$ and PMN-PT at cryogenic temperatures[1] SYED BUKHARI, MD ISLAM, JOHN BEAMISH, University of Alberta, ARIEL HAZIOT[2], Ecole Normale Superieure — Piezoelectric transducers are widely used as sensitive detectors of stress and to generate nanometer scale displacements. However, their piezoelectric coefficients often decrease substantially at cryogenic temperatures, limiting their performance in, e.g., low temperature STMs. We have recently used PZT shear transducers to measure the elastic modulus of solid ^{4}He at very low strains and to plastically deform the helium at high strains. From our elastic measurements, we inferred a shear piezoelectric coefficient d_{15} =1.0x10^{-10} m/V at temperatures below 1 K. This is about 6 times smaller than the room temperature value for PZT and comparable to d_{15} for single crystal $LiNbO_3$ transducers (7x10^{-11} m/V). We have developed a capacitive technique and have directly measured the temperature dependence of d_{15} for ceramic (PZT) and single crystal ($LiNbO_3$ and PMN-PT) shear transducers. PMN-PT has an extremely large d_{15} at room temperature (4x10^{-9} m/V) but it decreases rapidly below 100 K. $LiNbO_3$ has the smallest room temperature d_{15}, but it is nearly temperature-independent. At 4 K, the three types of transducers have similar piezoelectric shear coefficients.

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