



- 1 Piezoelectric transducer as 110 μm thick free-standing film with gold electrode.
- 2 Piezoelectric layer processed onto a lightly curved structures with embedded electrodes.
- 3 Examples of piezoelectric transducer e.g. for ultrasonic applications.
- 4 Piezoelectric sheet deposited onto a metal foil forming a bimorph.

PIEZO- AND FERROELECTRIC POLYMERS AS THIN LAYERS OR THICK SHEETS FOR SENSORS AND ACTUATORS

Developments

Piezoelectric materials convert applied mechanical stresses into electrical signals or applied electrical fields into dimension changes. At Fraunhofer IAP we develop complete sensor- and actuator systems based on piezoelectric polymers such as polyvinylidene fluoride (PVDF) and its copolymers with trifluoroethylene (P(VDF-TrFE)) or hexafluoropropylene (P(VDF-HFP)). Our research is focused on the material optimization, the processing of layers, films and sheets, the deposition of electrodes, the functionalization of the processed layers in order to render them piezoelectric and the characterization of their properties such as ferroelectric hysteresis, piezoelectric coefficients, resonance frequencies and coupling factors. We also study the integration of piezoelectric transducer into light-weight structures and ultrasonic measuring heads.

Our Service

According to customer requirements we offer to develop piezoelectric sensors and actuators as follows:

- material selection and adaptation (e.g. PVDF, P(VDF-TrFE), P(VDF-HFP) with variations of the VDF-content and different molecular masses), other material developments on request
- processing of layers, films and sheets with thicknesses between 500 nm and 400 μm , on substrates or freestanding
- layer, film or sheet processing by means of spin-coating, inkjet-printing, solvent-casting, doctor-blading as well as melt-pressing
- processing of electrodes via metallization (aluminum, gold, silver, chromium, single- and multi-layers), inkjet-printing (silver, PEDOT:PSS), air-brush (electrodes based on conductive nanoparticles).

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