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Transparent polypropylene ferroelectret films

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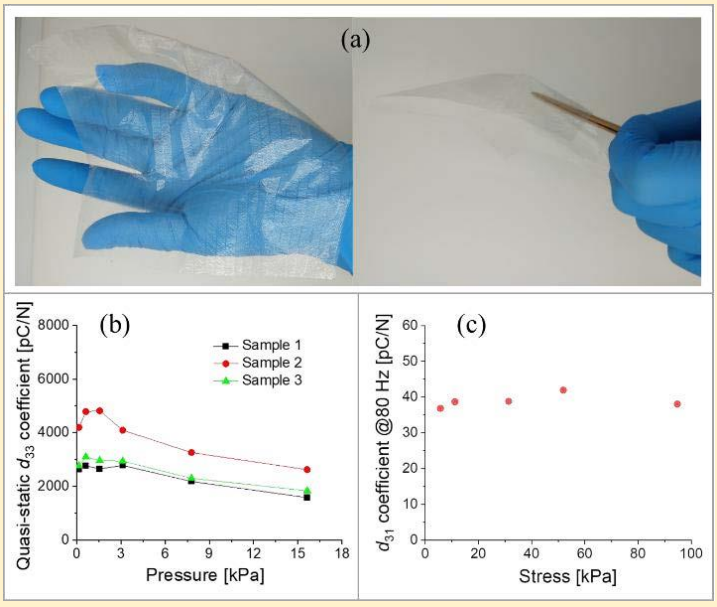
Introduction

Ferroelectret films made from polypropylene (PP), featuring transparency, ultra-lightweight, extremely small thickness, as well as significant longitudinal and transverse piezoelectric activity, are prepared and characterized in this study. Such films have great potentials in health care, sports training, energy harvesting, and etc.

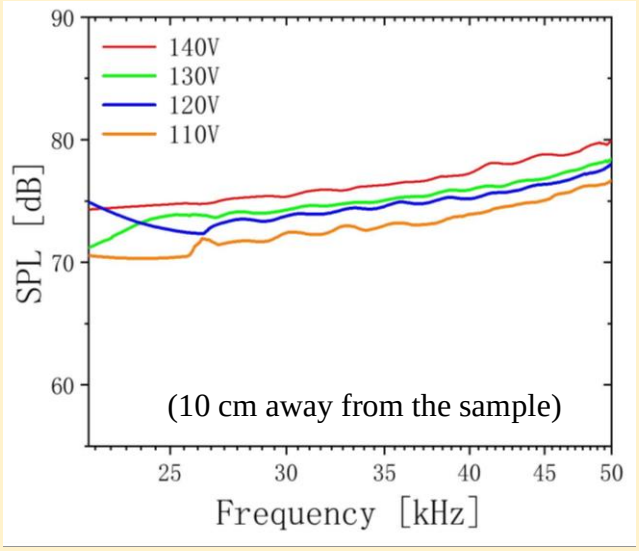
Results and Discussion

The results show that the light transmittance, area density, and thickness of the fabricated PP films are 90%, 3.5 g/m^2, and 20 μm, respectively. For PP ferroelectret films with a thickness of 20 μm, a quasi-static piezoelectric d_{33} coefficient of few thousands pC/N at 3.4 kPa, and a dynamic piezoelectric d_{31} coefficient of 40 pC/N at 80 Hz and 20 kPa were obtained. In the ultrasonic frequency band ranging from 20 to 50 kHz, the sound pressure level (SPL) of the transducer based on such PP ferroelectret in transmitting mode reached 70 to 80 dB at driving voltage ranging 110 to 140 V_{rms}.

Piezoelectricity



SPL of a ultrasonic transmitter based on PP Ferroelectret



Conclusion

Owing to the excellent properties, such newly developed PP ferroelectret films are promising candidates for flexible electronic devices, lightweight wearable vital signal detectors, electronic skin on robots, air-coupled ultrasonic transducers, vibrational energy harvesters, high-performance speakers, and so on.