

Abstract

Project title:

Electromechanical Coupling of Polymeric Films studied by using Piezoresponse Force Microscopy

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Electromechanical coupling is a fundamental mechanism underlying the functionality of many materials, including inorganic materials such as piezoelectric materials as well as many biological systems. The applications of electromechanical property cover many areas including sonar, medical imaging, sensors and energy harvesting technologies.

The aim of this project is to investigate the piezoelectric properties of two polymer films, polyvinylidene fluoride (PVDF) and polyvinylidene trifluoroethylene (P(VDF-TrFE)). Piezoresponse Force Microscope (PFM) is used to scan the film surface under different applied voltages, and to obtain the nanoscale structural images of height, frequency, amplitude and phase.

A proportionality constant (d_{33}) was obtained for each sample. Local piezoelectric aging property was then studied by poling a certain area with negative bias followed by positive bias. Furthermore, hysteresis loop measurements were carried out on these two film samples. This project has demonstrated that both films show strong piezoelectric response. This can contribute towards future research of microelectronic devices, such as memory and data storage devices.