

Piezoelectricity Due to Space Charge at Ferroelectret

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Abstract:

The piezoelectric motion of ferroelectrets fabricated from porous polyethylene (p-PE) film was investigated using the piezoresponse force microscopy (PFM) developed newly on the basis of atomic force microscope (AFM). First, we fabricated the ferroelectret p-PE (Fp-PE) film with the porosity of 58% and piezoelectric constant d_{33} of 100 pC/N. Then we obtained an AFM image of the Fp-PE film. As a result, it was found that pores with the diameter of about 0.0003 mm is almost homogeneously distributed in the Fp-PE film. Next, we got the PFM image of Fp-PE film under the application of ac voltage with the frequency of 10 kHz and the amplitude of 1V. From these observations, it was found that the surroundings of the pore change position in one direction following the application of ac voltage, but positions away from the surroundings of the pore are not allowed to move freely. These results indicate that the electrical charge trapped in a cavity (surroundings of the pore) in Fp-PE film plays an important role in the piezoelectricity. □