TUNING THE FERROELECTRIC PROPERTIES THROUGH A MAGNETIC FIELD

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Preparation and characterization of multiferroic materials in which ferroelectricity and ferromagnetism coexist would be a milestone for functionalized materials and devices. We have demonstrated that the electric polarization of ferroelectric polymer, poly-vinylidene fluoride (PVDF), can be controlled by applying an external magnetic field. Samples were created in a layered heterostructure, with the key part of a PVDF layer sandwiched by two layers of Fe thin films. We found that as the applied magnetic field is changed, the switching of electric polarization for the PVDF displayed a dependence on the external magnetic field. We also noticed that both coercivity and polarization for the PVDF polymer display hysteretic features according to the change of an applied magnetic field. Our study showed that the thickness of both the iron layer and the PVDF layer have an effect on the magnetoelectric coupling in our samples. The same magnetostriction strain applied to a thicker PVDF layer becomes tougher to flip the polarization compared to a thinner PVDF layer. As the iron film thickness increases, the magnetoelectric strain also increases, and the PVDF polymer can be easily saturated and the polarization is more easily flipped. We have shown that it is possible to control the ferroelectric properties of a PVDF film by tuning the magnetic field in heterostructures. Our study shows that this system could have show promising applications for new information technology and devices.