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Enhanced Piezoelectric Response in Hybrid Perovskite via Interfacing with Ferroelectric Pb(Zr,Ti)O_3 JINGFENG SONG, ZHIYONG XIAO, BO CHEN, SPENCER PROCKISH, XUEGANG CHEN, DONG WANG, JINSONG HUANG, XIA HONG, University of Nebraska-Lincoln — In this work, we have carried out a comprehensive study of the piezoelectric properties of polycrystalline hybrid perovskite $CH_3NH_3PbI_3$ ($MAPbI_3$) thin films on two types of substrates. We spin coated 20-100 nm $MAPbI_3$ thin films on gold and ferroelectric Pb(Zr,Ti)O_3 (PZT), and characterized their piezoelectric coefficient d_{33} using piezoresponse force microscopy (PFM). The $MAPbI_3$ thin films on gold showed a d_{33} of ˜0.4 pm/V. The epitaxial PZT films (˜50 nm) were deposited on (La,Sr)MnO_3/$SrTiO_3$ substrates, with polarization uniformly oriented in the up direction. For $MAPbI_3$ films on PZT, there are regions showing clear PFM phase response, suggesting that $MAPbI_3$ is polar with out-of-plane polarization. The PFM amplitude image of $MAPbI_3$ indicated the existence of both constructive and destructive piezoresponse with that of PZT. The extracted d_{33} is 4 pm/V, 10-fold higher than that on gold. The enhanced piezoresponse is attributed to the dipole-dipole interaction between $MAPbI_3$ and PZT. Our study points to an effective route to engineer the piezoelectric properties $MAPbI_3$ for applications such as mechanical actuators and energy harvesting.

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