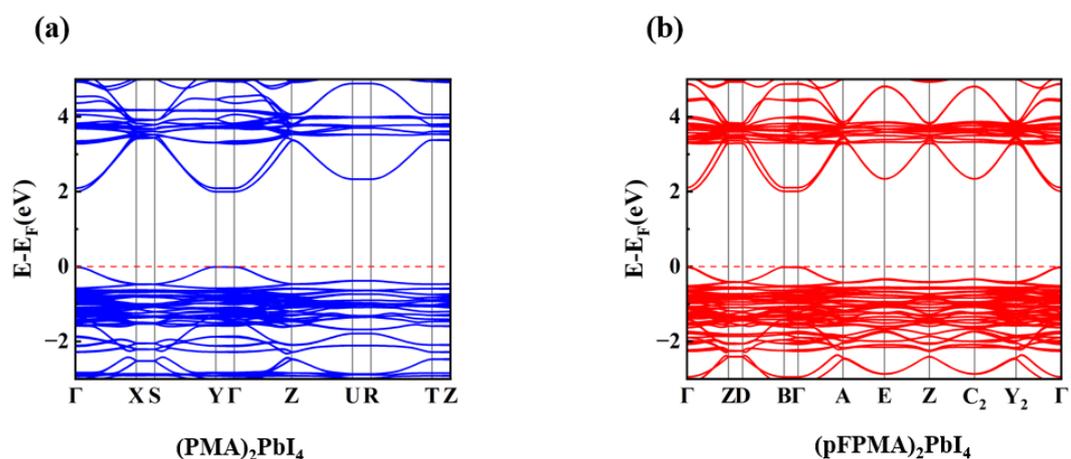
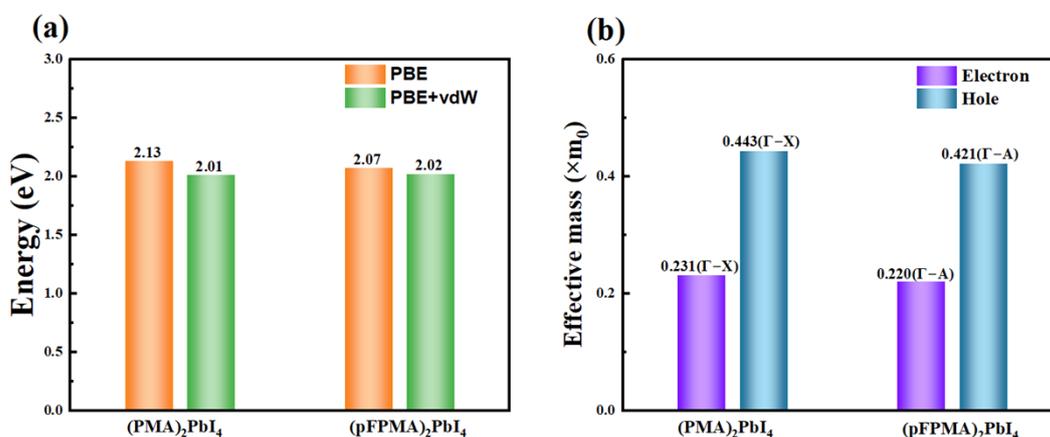


**Figure S1.** (a) XRD patterns of  $(\text{PMA})_2\text{PbI}_4$  and  $(\text{pFPMA})_2\text{PbI}_4$  films. The inset is the enlarged XRD patterns with  $2\theta$  between  $5.8^\circ$  and  $6.8^\circ$ . (b) UV-vis absorption spectra of the  $(\text{PMA})_2\text{PbI}_4$  and  $(\text{pFPMA})_2\text{PbI}_4$  films. The inset is the band gap of films.



**Figure S2.** Calculated electronic band structure for  $(\text{PMA})_2\text{PbI}_4$ . (b) Calculated electronic band structure for  $(\text{pFPMA})_2\text{PbI}_4$ .



**Figure S3.** (a) Band gaps of  $(\text{PMA})_2\text{PbI}_4$  and  $(\text{pFPMA})_2\text{PbI}_4$  calculated using PBE and PBE + vdW. (b) Effective masses of electrons and holes in  $(\text{PMA})_2\text{PbI}_4$  and  $(\text{pFPMA})_2\text{PbI}_4$ .