

Band-Edges of Hybrid Halide Perovskites under the Influence of Mixed Cation Approach: A Scanning Tunneling Spectroscopic Insight

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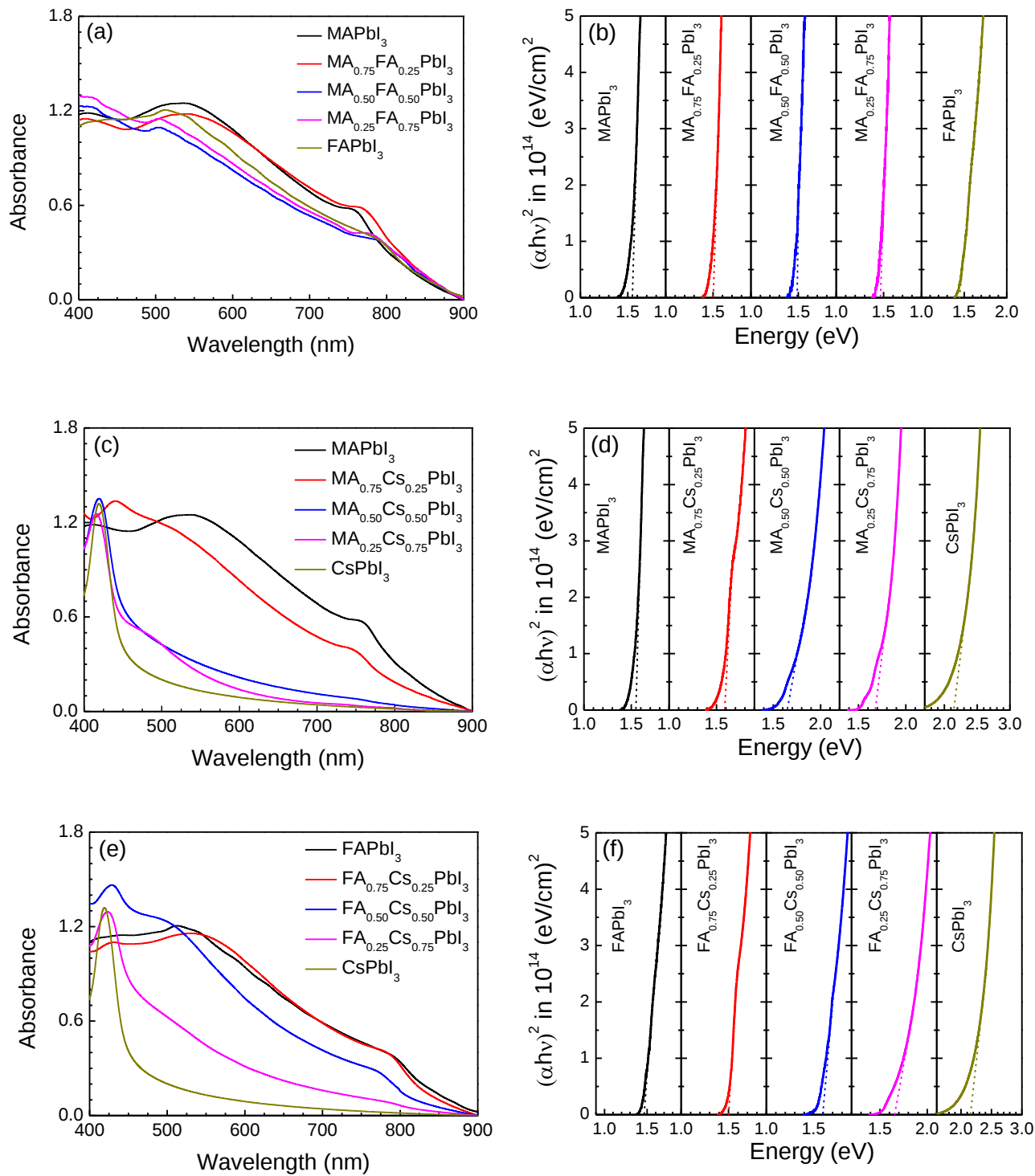


Figure S1. Optical absorption spectra and corresponding Tauc plots of (a and b) $\text{MA}_{1-x}\text{FA}_x\text{PbI}_3$, (c and d) $\text{MA}_{1-x}\text{Cs}_x\text{PbI}_3$, and (e and f) $\text{FA}_{1-x}\text{Cs}_x\text{PbI}_3$ at different doping contents.

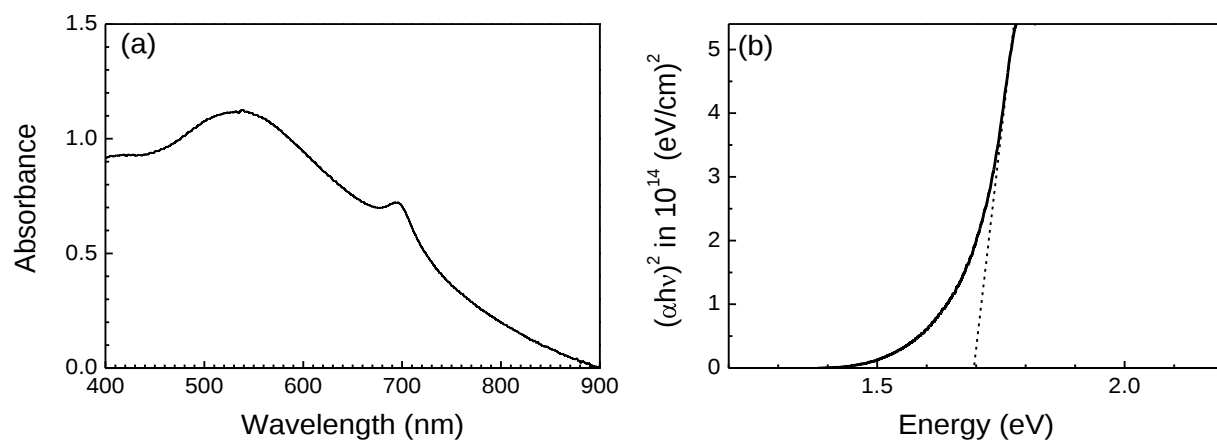


Figure S2. (a) Optical absorption spectrum and (b) corresponding Tauc plot of α -CsPbI₃.

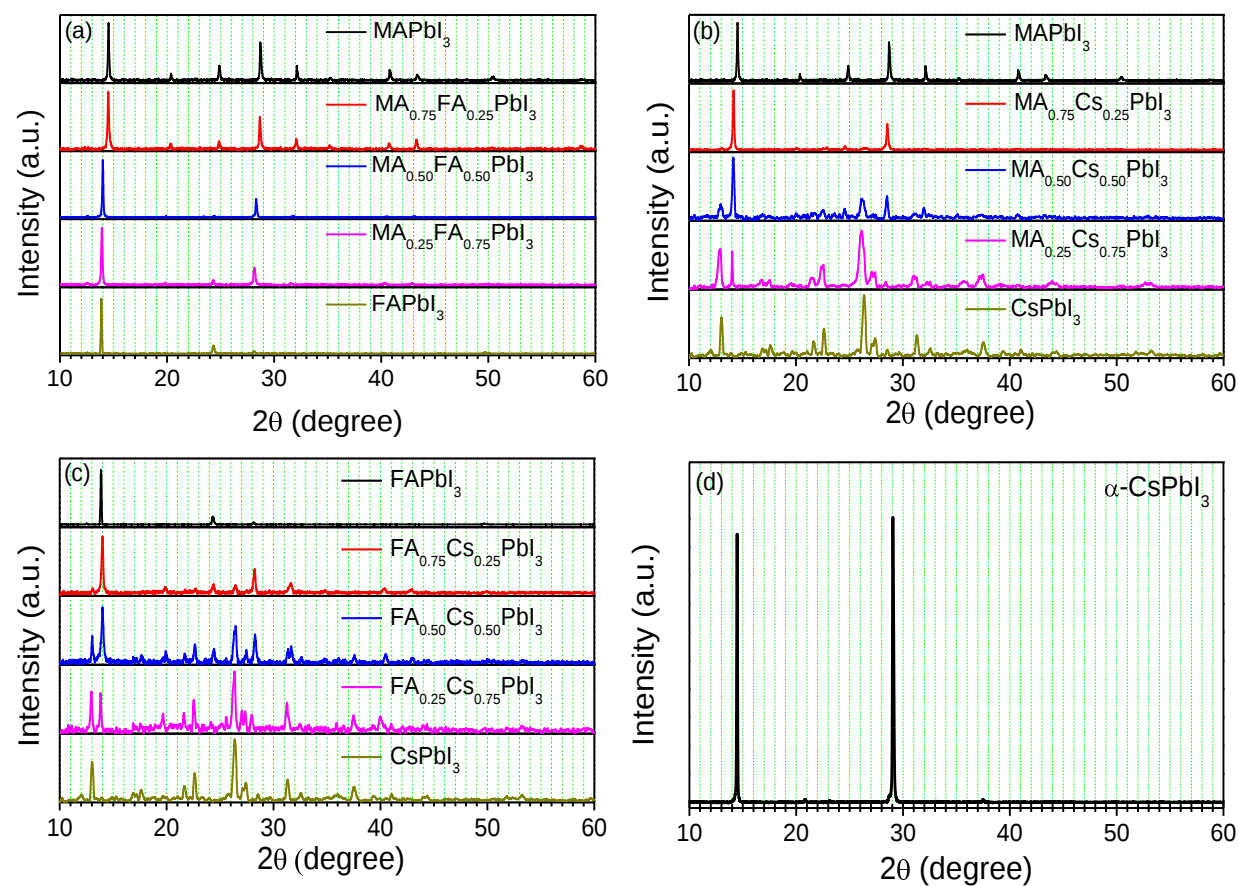


Figure S3. XRD patterns of (a) MA_{1-x}FA_xPbI₃, (b) MA_{1-x}Cs_xPbI₃, (c) FA_{1-x}Cs_xPbI₃ perovskite thin-films at different doping contents and (d) α -CsPbI₃.

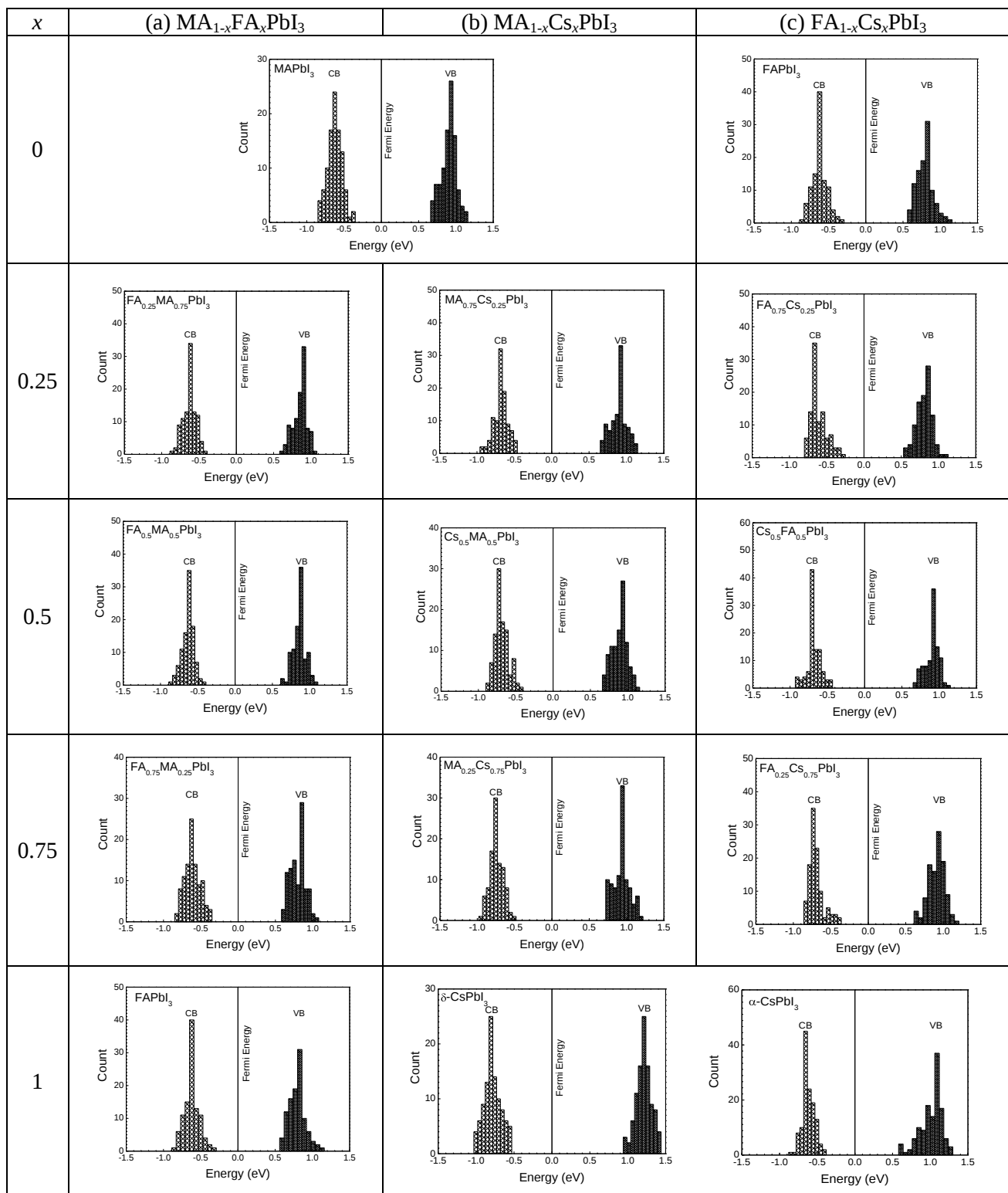


Figure S4. Histograms of CB and VB-edges of (a) $\text{MA}_{1-x}\text{FA}_x\text{PbI}_3$, (b) $\text{MA}_{1-x}\text{Cs}_x\text{PbI}_3$, and (c) $\text{FA}_{1-x}\text{Cs}_x\text{PbI}_3$ perovskite thin-films at different doping contents. For CsPbI_3 , histograms have been provided for its delta- and alpha-phases, which represent non-perovskite and perovskite structure, respectively.

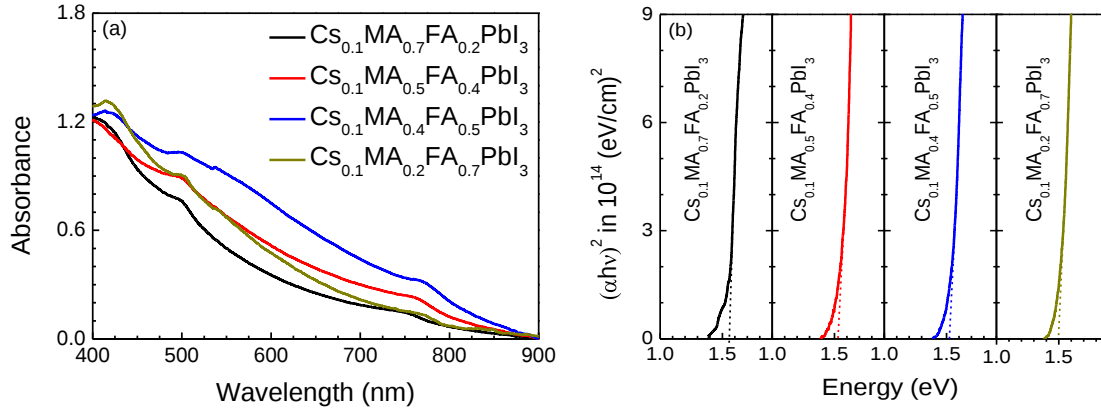


Figure S5. (a) Optical absorption spectra and corresponding (b) Tauc plots of $\text{Cs}_{0.1}\text{MA}_{0.9-x}\text{FA}_x\text{PbI}_3$, ($x = 0.2, 0.4, 0.5$ and 0.7).

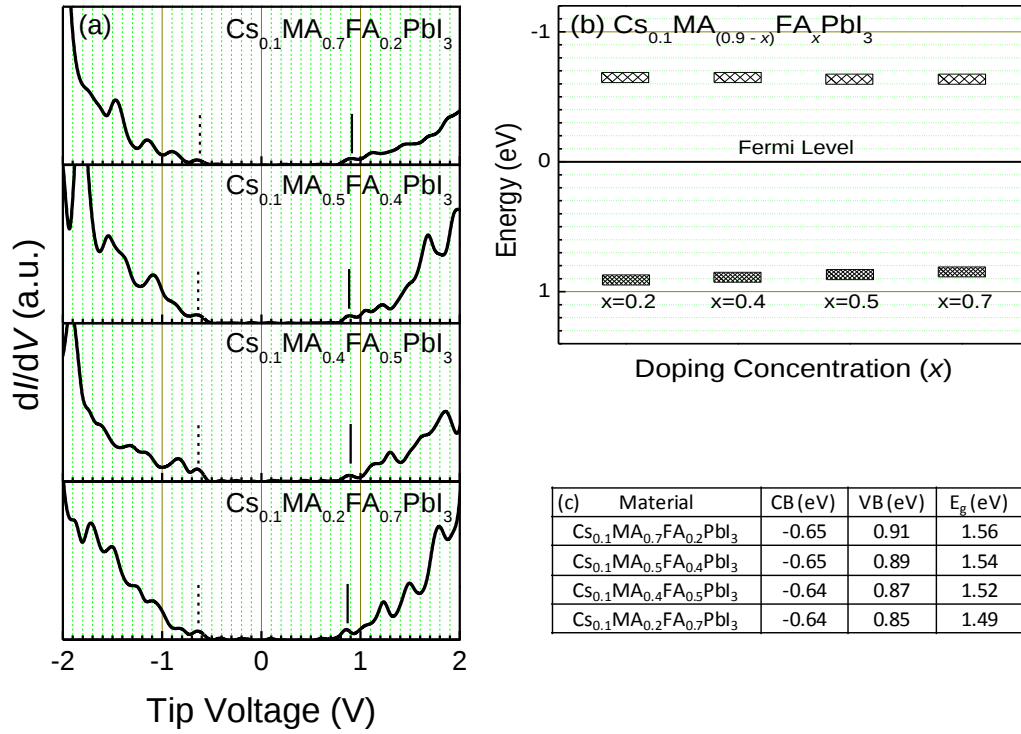


Figure S6. (a) Typical dI/dV spectra, corresponding (b) band diagram, and (c) band energy values of $\text{Cs}_{0.1}\text{MA}_{0.9-x}\text{FA}_x\text{PbI}_3$, ($x = 0.2, 0.4, 0.5$ and 0.7).

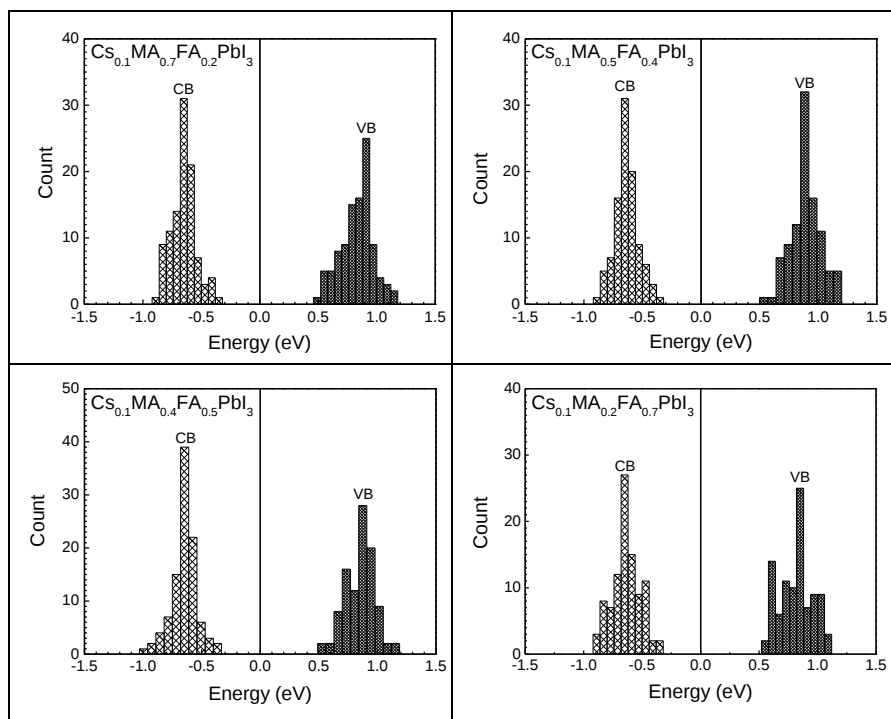


Figure S7. Histograms of VB and CB edges of $\text{Cs}_{0.1}\text{MA}_{0.9-x}\text{FA}_x\text{PbI}_3$ ($x = 0.2, 0.4, 0.5$ and 0.7).