Crystallographic study of in–plane aligned hybrid perovskite thin film

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Lead halide perovskites CH₃NH₃PbX₃ (X=Cl, Br, I) have received great interest in the past few years because of their excellent photoelectronic properties as well as their low-cost solution process. Their theoretical efficiency limit of the solar cell devices was predicted around 31% by a detailed balance model for the reason that exceptional light-harvesting and superior carrier transport properties. Additionally, these excellent properties contribute to the applications of optoelectronic devices such as LASERs, LEDs, and photodetectors. Since these devices are mainly using perovskite thin film, one of the most important factor to decide the efficiency of these applications is the quality of the film. Even though, optoelectrical devices are composed of polycrystalline thin film in general, not a single crystalline form which has longer carrier diffusion length and lower trap density. For these reasons, monodomain perovskite thin films have potential to elicit an optimized device efficiency.

In this study, we analyzed the crystallography of the in-plane aligned perovskite thin film by X-ray diffraction (XRD) and selected area electron diffraction (SAED). Also the basic optic properties of perovskites were checked using scanning electron microscopy (SEM) and UV-Vis spectrum. From this work, the perovskite which is aligned in all directions both of out-of-plane and in-plane was fabricated and analyzed.

Keywords: Perovskite, single crystal, crystallography, thin film