Single-crystal $MAPbBr_3$ based flexible light-emitting diodes prepared by cast-capping method

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Low cost and flexible devices are demands of next optoelectronic generation devices. Recently, perovskites have become promising materials due to their attractive properties for solar cells and light emitting devices with tunable emission wavelengths, long carries life time and low temperature processing [1]. Here we present "single-crystal" $MAPbBr_3$ based flexible light-emitting diodes prepared by cast-capping method [2]. This method includes two simple processes: casting a precursor perovskites solution on a substrate and capping with another substrate. Then, large-sized single cubic crystals were formed between the substrates.

We first fabricated a very simple flexible LED: ITO/$MAPbBr_3$/ITO (Fig. 1a) where ITO coated-PET substrates were used to make flexible electrodes. After dryness for few days, single-crystal $MAPbBr_3$ with few-μm thickness was grown between the ITO-PET electrodes (Fig. 1c-d). Secondary, LEDs with PET/ITO/ZnO/$MAPbBr_3$/MoO_3/ITO/PET structure as shown in Fig. 1b was built. ZnO and MoO_3 films were used as electron and hole transport layers, respectively. The ZnO thin film was prepared by the sol-gel method with zinc acetate dissolved in methanol to give 1.5 mg/mL concentration. The ZnO solution was spin-coated on the ITO/PET substrate and annealed at 100°C for 12 hours. The MoO_3 film (~10 nm thick) was vapor-deposition on another ITO/PET substrate. Figures 2c, d and e show transmission, fluorescence micrographs and PL spectrum of single-crystal $MAPbBr_3$ grown between the transparent ITO/PET substrates by the cast-capping method. Their LED performances will be presented at the poster.

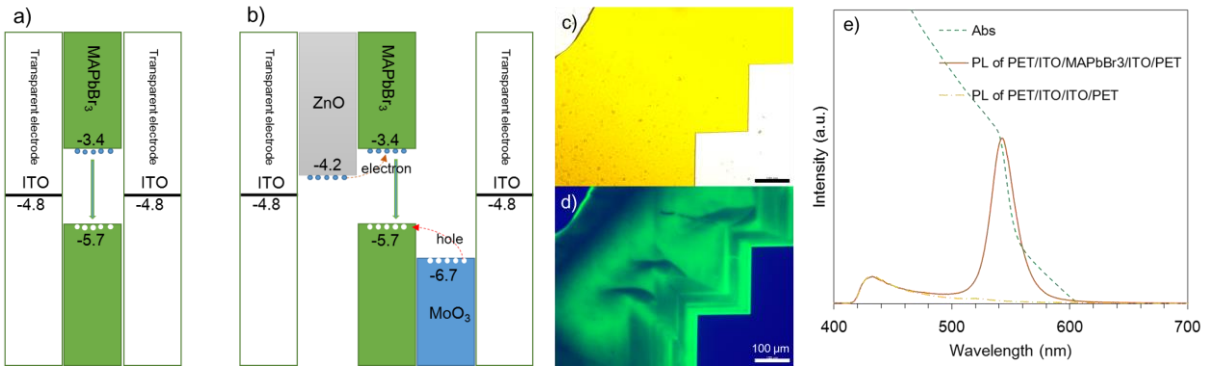

Fig. 1: a) and b) are energy diagrams for fabricated LEDs. c) and d) are transmission and fluorescence micrographs of single-crystal $MAPbBr_3$, respectively. e) Absorption and PL spectra of PET/ITO/$MAPbBr_3$/ITO/PET.

References

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[2] Van-Cao Nguyen, et al., *Appl. Phys. Lett.* **108**, 261105 (2016).