Centrifugal Coated Quasi-2D CsPb$_2$Br$_5$ Emitter Layer for Perovskite Light-Emitting Diodes and Lasing

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Low-cost and room-temperature solution-processed inorganic two dimensional perovskites with strong exciton binding energy, chemistry stability, and color-tunable photoluminescence are promising for light-emitting diodes (LEDs) and laser application.\(^1\) However, efficient pure inorganic quasi-2D perovskite based PeLEDs have not been realized yet. Here centrifugal-coated quasi-2D CsPb$_2$Br$_5$ films from nanocrystal colloidal are successfully developed. This technique allows for the formation of very thin continuous layers of high-quality quasi-2D CsPb$_2$Br$_5$ which is challenging for traditional spin-coating methods as shown in Fig. 1. Through thickness control process and without additional treatment, we obtained a compact and uniform CsPb$_2$Br$_5$ emitter layer with a photoluminescence quantum yield of 35% and demonstrated perovskite LEDs with good external quantum efficiency of 2.6%. We in-situ studied the carrier traps of complete CsPb$_2$Br$_5$ based LEDs and observed two types of traps using thermally stimulated current technique. Further, a random lasing from centrifugal-coated quasi-2D CsPb$_2$Br$_5$ film was also demonstrated with a promising low threshold.\(^2\)

Figure 1. (a) XRD spectra of centrifugal casted CsPb$_2$Br$_5$ film and vapor deposited CsPbBr$_3$ film. (b) Absorption and photoluminescence spectra of CsPb$_3$Br$_5$ films. Insert is images of film under UV lamp irradiation.

References:
2. C. Qin, T. Matsushima, A. Sandanayaka, C. Adachi, to be submitted.