Rapid and convenient crystallization of quantum dot $CsPbBr_3$ inside a phosphate glass matrix

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Abstract

Although inorganic halide perovskite quantum dots (QDs) have promising photophysical properties and a wide range of applications, they suffer from some issues such as poor water and thermal stabilities. Here, we developed a simple strategy to embedded $CsPbBr_3$ QDs in a glass matrix by adopting conventional melt-quenching technique. We systematically presented the modified glass melting and quenching technique for the direct crystallization of $CsPbBr_3$ QDs inside a glass matrix. Crystallization of the QDs took place during the cooling of the quenched hot glass melt. The effect of the concentration of Cs_2CO_3, $PbBr_2$ and NaBr on the formation of $CsPbBr_3$ QDs size was also identified. The glasses containing $CsPbBr_3$-embedded QDs showed photoluminescence emission stability without any alteration in their emission peaks and full-width at half-maximum for at least six months under ambient conditions. Our results provide new insights into rapid and convenient crystallization of QDs inside the protective glass matrix. The technique can be utilized to fabricate several rare earth ions co-doped QDs glasses for various color tunable lighting optical devices application.

The full text can be found at the following link:

https://doi.org/10.1016/j.jallcom.2021.158974