Improved Production Yields and Stabilities of $MAPbBr_3$ Perovskite Quantum Dots and Their Use in Stretchable and Self-Healable Color Filters

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Organic-inorganic hybrid $CH_3NH_3PbBr_3$ ($MAPbBr_3$) perovskite quantum dots (PQDs) are considered promising for optoelectronic devices. However, during purification, polar protic and aprotic non-solvents can destruct the structure of $MAPbBr_3$ perovskites. This significantly lowers the production yields and degrades the optical properties of the PQDs. Herein, we demonstrate the feasibility of using methyl acetate (MeOAc) as an effective non-solvent for purifying $MAPbBr_3$ with high production yields. The MeOAc-washed MAPbBr3 PQDs maintain their high photoluminescence quantum yields and crystalline structures for long periods with suppressed nonradiative recombination. MeOAc undergoes a hydrolysis reaction in the presence of the PQDs, and the resulting acetate anions partially replace the original surface ligands without damaging the PQD cores. Lastly, the PQDs were composed with a thermoplastic elastomer to obtain stretchable and self-healable color filters for a white light-emitting diode.