

## Cesium Lead Halide Perovskite Production through Droplet Based Modular Microfluidic System and its Fast Anion-Exchange

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All-inorganic perovskite nanocrystals have shown as excellent optoelectronic materials with high efficiencies in photovoltaic cell and light emitting applications. Here we present the droplet-based modular microfluidic system for the step-wise synthesis and in-situ anion-exchange in highly luminescent perovskite nanocrystals of cesium lead halide ( $\text{CsPbX}_3$ , X = Cl, Br, I). Microreactor provide small reaction volumes that are more homogeneous with correspond to concentration, temperature, and mass transport, resulting to a better control of the reaction parameters. By introducing the halide ions (i.e., Cl and I) in the primary generated  $\text{CsPbBr}_3$  colloidal solution, the bright photoluminescence can be changed over the entire visible spectral region simultaneously. Furthermore, we demonstrate that fast anion-exchange can be generated various types of perovskite nanocrystals with uniform morphology and high monodispersity. We believe that the broad accessible emission range and in-situ anion exchange make various forms of perovskite an ideal platform for fundamental optoelectronic researches and the investigation of future devices.