Chemical Strategy Towards Hybrid Lead Halide Perovskite: From bulk crystal to nanocrystal

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We report chemical routes for the synthesis of both nanocrystals and bulk crystals of methylammonium (MA) lead halide perovskites employing N-methyl formamide (NMF) as a source of MA ions. Colloidal nanocrystals were prepared by a transamidation reaction between NMF and an alkyl amine (oleylamine). The nanocrystals showed photoluminescence quantum yields reaching 74% for MAPbBr3 and 60% for MAPbI3. Bulk crystals were grown at room temperature, with no need for an antisolvent, by the acid hydrolysis of NMF. Important advantages of using NMF instead of MA salts are that the syntheses involve fewer steps and less toxic and less expensive chemicals.