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Stimulated emission and lasing from all-inorganic perovskite quantum dots HANDONG SUN, YUE WANG, Nanyang Technological University, XIAOMING LI, ZENG HAIBO, Nanjing University of Science and Technology — We present superior optical gain and lasing properties in a new class of emerging quantum materials, the colloidal all-inorganic cesium lead halide perovskite quantum dots (IPQDs) ($CsPbX_3$, X = Cl, Br, I). Our result has indicated that such material system show combined merits of both colloidal quantum dots and halide perovskites. Low-threshold and ultrastable stimulated emission was demonstrated under atmospheric condition. The flexibility and advantageous optical gain properties of these $CsPbX_3$ IPQDs were manifested by demonstration of an optically pumped microlaser. The nonlinear optical properties including the multi-photon absorption and resultant photoluminescence of the $CsPbX_3$ nanocrystals were investigated. A large two-photon absorption cross-section of up to ˜1.2105 GM is determined from 9 nm-sized $CsPbBr_3$ nanocrystals. Moreover, low-threshold frequency-upconverted stimulated emission by two-photon absorption was observed from the thin films of close-packed $CsPbBr_3$ nanocrystals. We further realize the three-photon pumped stimulated emission in green spectra range from colloidal IPQD.

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