White Light Emission from Low Dimensionality Halide Perovskites

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Hybrid halide perovskites are a novel class of semiconductor materials with promising and versatile optoelectronic properties, enabled by their chemically adjustable structures and dimensionality. The diversity in the metal ions, halide anions, and organic spacers enables a wide range of materials with highly tunable properties and variable dimensionalities. These materials are studied for various applications such as solar cells, detectors, and light-emitting diodes. The ability to control and adjust the optical properties for a required application is significant. Thus, an improved understanding of the structure and optical mechanisms is crucial.

Specific low-dimensionality hybrid halide perovskites exhibit white-light emission at room temperature, associated with self-trapped excitons (STE), making them ideal candidates for illumination applications. We study the correlation between structural motifs of low dimensionality (2D, 1D) halide perovskites and their STE emission. We further study how the composition and specifically exchanging the halide anions while maintaining the structure affect the STE properties.

Figure

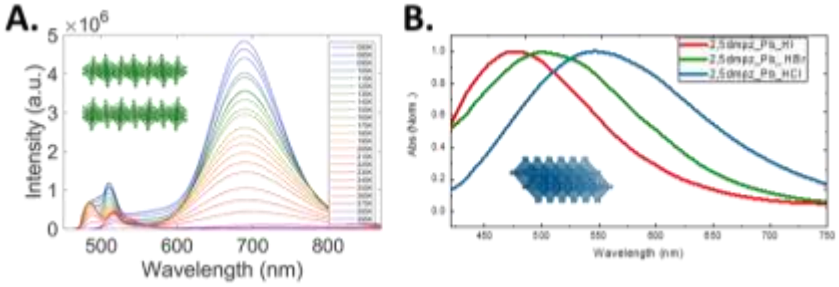

Figure 1: A. Temperature dependent photoluminescence of BA_2PbI_4 2D perovskite exhibiting transition from narrow photoluminesceence at room temperature to STE emission at low temperatures. B. STE emission of 1D perovskite – $(2,5dmpz)PbX_4$ (X = Cl, Br, I).