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Tuneable Excitonic Luminescence in 2D hybrid perovskites

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Two-dimensional hybrid perovskites have attracted considerable interest for combining Van der Waals properties like quantum confinement and reduced dielectric screening with the structural tunability of perovskites. In these materials, both layer composition and sublayer number can be varied, impacting quantum confinement effects. These structures are often modeled as periodic quantum wells separated by transparent organic layers. Here, we show that excitonic luminescence in these quantum wells—specifically peak position, full width at half maximum, and intensity—depends strongly on nanosheet layer count, challenging the assumption of minimal impact from layer number.

Using single crystals of n-butylammonium lead iodide (BAPI) 2D perovskite, micromechanically exfoliated to create nanosheets of differing thickness, we applied atomic force microscopy (AFM), and time-resolved and steady-state photoluminescence microscopy at room and cryogenic temperatures. Variations in excitonic photoluminescence were notable, especially at low temperatures below the order-disorder phase transition, where layer number shifted excitonic PL peaks by up to 120 meV.

Type of presence

Presence online

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