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Exciton Dynamics of 2D Hybrid Perovskite Nanocrystal[1] RUI GUO, Department of Physics, Florida International University, ZHUAN ZHU, Department of Electrical and Computer Engineering, University of Houston, ABDELAZIZ BOULESBAA, Oak Ridge National Laboratory, SWAMINATHAN VENKATESAN, Department of Electrical and Computer Engineering, University of Houston, KAI XIAO, Oak Ridge National Laboratory, JIMING BAO, YAN YAO, Department of Electrical and Computer Engineering, University of Houston, WENZHI LI, Department of Physics, Florida International University — Organic-inorganic hybrid perovskites have emerged as promising materials for applications in photovoltaic and optoelectronic devices. Among the perovskites, two dimensional (2D) perovskites are of great interests due to their remarkable optical and electrical properties as well as the flexibility of material selection for the organic and inorganic moieties. In this study, we demonstrate the solution-phase growth of large square-shaped single-crystalline 2D hybrid perovskites of $(C_6H_5C_2H_4NH_3)_2PbBr_4$ with a few unit cells thickness. Compared to the bulk crystal, a band gap shift and new photoluminescence (PL) peak are observed from the hybrid perovskite sheets. Color of the 2D crystals can be tuned by adjusting the sheet thickness. Pump-probe spectroscopy is used to investigate the exciton dynamics and exhibits a biexponential decay with an amplitude-weighted lifetime of 16.7 ps. Such high-quality $(C_6H_5C_2H_4NH_3)_2PbBr_4$ sheets are expected to have high PL quantum efficiency which can be adopted for light-emitting devices.

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