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# Giant blueshifts of excitonic resonances in two-dimensional lead halide perovskite

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## Abstract:

Two-dimensional (2D) methylammonium lead halide perovskites (MAPbX<sub>3</sub>) have gained intensive research attention in past two years. Due to their quantum and dielectric confinements, 2D MAPbX<sub>3</sub> exhibited giant exciton binding energy, increased bandgap, and blueshifts of photoluminescence. Some of these novel characteristics have been successfully utilized to improve the performances of optoelectronic devices. However, up to now, the studies of quantum confinements are restricted within the linear region. Lots of important effects in quantum systems such as the exciton-exciton interaction have never been considered. Herein we synthesized the 2D MAPbBr<sub>3</sub> nano-sheets with layer number  $n = 7-10, 5, 3, 1$  and characterized their nonlinear optical properties under high excitation density. Due to the strong excitonic resonance, we have achieved significantly increased third-harmonic generation (THG) from the 2D MAPbBr<sub>3</sub> nano-sheets. The deduced  $\chi^3$  of few-layer MAPbBr<sub>3</sub> nano-sheets was more than 50 times larger than the bulk MAPbBr<sub>3</sub> microblocks. While the THG was strongly dependent on the excitonic resonance, we found that their peak wavelengths were different from the ones of excitons in linear absorption

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