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Colloidal PbS Nanosheets[1] KAMAL SUBEDI, GHADENDRA BHANDARI, LIANGFENG SUN, Bowling Green State Univeristy, SUN'S RESEARCH GROUP TEAM — Colloidal quantum dots have emerged as an important material for optoelectronic devices due to their tunable optical properties originated at quantum confinement. Charge transfer in the thin film made of colloidal quantum dots for a device is always hindered by the presence of spacing ligands among them, since they are typically insulators. Making two-dimensional nanosheets can effectively reduce these hindrances, yet retain the tunable quantum confinement in one dimension. It is expected that optoelectronic devices made from such nanosheets will have better performance due to the improved charge carrier mobility. In our recent work, two-dimensional PbS nanosheets (a few nanometers thick with lateral size of a few hundred nanometers) have been successfully synthesized through oriented attachments of PbS nanocrystals. Nanosheets of different thickness were synthesized by control of the reaction temperature. Their energy gaps were revealed by optical absorption and emission measurements. The dependence of the energy gap on the thickness (L) of the nanosheets follows a 1/L law, demonstrating perfect quasi-two-dimensional semiconductor systems with pure one-dimensional confinement. The distinct properties of PbS nanosheets make them valuable for fundamental study and applications.

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