

## Synthesis and Characterization of 2-dimensional $\text{PbX}_2$ (X = I, Br and Cl) nanoparticles

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Lead iodide ( $\text{PbI}_2$ ) in its crystalline form is used as a detector material for high-energy photons including gamma and X-rays. Apart from that methylammonium perovskites from lead halides have recently attracted considerable interest as alternative solar cell materials. The preparation of Two-dimensional Lead iodide particles is well-known in the anorganic chemistry. However, the thickness of these structures is always above 100 nm. We present a colloidal nanoparticle synthesis where the solvent is also the main ligand and the thickness of the so prepared nanosheets (NS) is far below 100 nm. Further, we show that the crystal structure changes by increasing the reaction temperature or by performing the synthesis for a longer time period. In addition to that we demonstrate a route to prepare NS of lead bromide ( $\text{PbBr}_2$ ) as well as samples of lead chloride ( $\text{PbCl}_2$ ) which consists partly of 2-dimensional material by slightly changing the reaction parameters of the  $\text{PbI}_2$  synthesis.