Structural Diversity in Lead-halide Based Organic-inorganic Hybrids

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Organic-inorganic hybrids have been have been studied by researchers for a fair amount of time. This fascination is driven by the structural diversity exhibited by this class of compounds, and the technologically attractive opportunity to combine the desirable properties from the respective components into a single nanocomposite.

In the literature, most of compounds with the general formulae $[CH_3(CH_2)_nNH_3]_2MX_4, \qquad [H_3N(CH_2)_nNH_3]_2MX_4 \quad or \ [C_6H_5(CH_2)_2NH_3]_2MX_4$ reported, have a layered hybrid perovskite type structure.

In our laboratory we set out to augment the body of available knowledge by a systematic investigation into the range and type of structures that can be formed by combining simple primary amines with lead halides. Although far from complete, our study to date comprises in excess of 60 new crystal structures, and has revealed a great structural diversity, particularly in terms of the nets formed by the inorganic components. To date we have observed layers of corner sharing octahedra, linear chains of face sharing octahedral as well as number of mixed intermediates. In all we have to date identified 12 distinct topologies within the inorganic sections of the class of compounds that we are investigating.

Keywords: organic-inorganic hybrids, nanocomposite, nets