

Structural Control and Their Effects on the Properties of One-Dimensional Organic-Inorganic Perovskites

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Organic-inorganic hybrid perovskites show tunability in their structures by controlling the nature of the organic cationic components. The variety of dimensionality includes three-, two- and one-dimensional perovskite structures. Compared with 3D and 2D layered structure, the limited studies were done on 1D structure, in which the metal halide octahedrons are connected in a chain.

1D perovskites are one of the most potential candidates to understand completely the properties of perovskite materials. The 1D perovskite structures include side- and face-shared octahedral perovskite structures (Figure 1b,c) in addition to the parent corner-shared octahedral chains (Figure 1a). Though a few studies regarding the preparation of 1D structures were previously reported,^[1] the systematic investigations of the relationship between structures and their properties have not yet achieved.

In this respect, we planned to make crystals of 1D perovskite with aromatic organic compounds and succeeded in the preparation of the single crystals with 4-aminomethylpyridine and pyridine as organic components. The X-ray crystallographic analyses of the crystals showed that the crystals adopted side- and face-shared 1D perovskite structures, respectively (Figure 2). The absorption spectra of the crystals showed that a large difference in the absorption edge was observed in spite of the same dimensionality.

Reference: [1] B. Saparov, D. B. Mitzi, *Chem. Rev.* **2016**, *116*, 4558-4596.

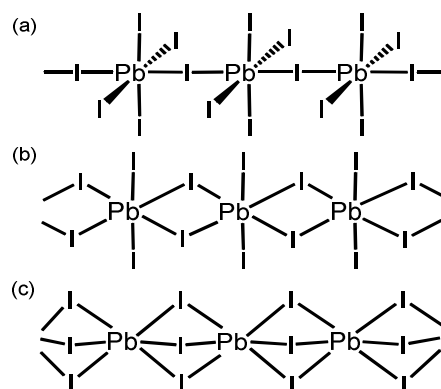


Figure 1. Chemical structures of (a) corner- (b) side- and (c) face-shared 1D perovskites

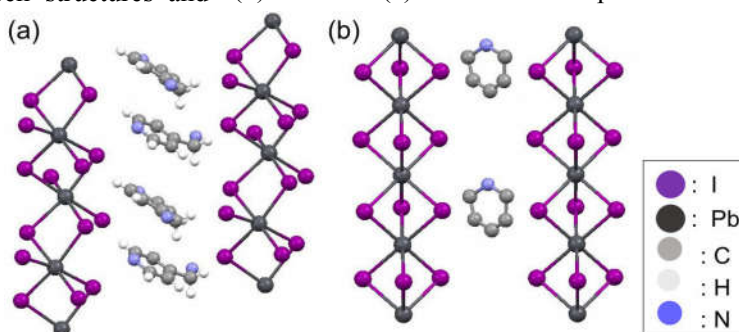


Figure 2. The side views of the crystal structures of 1D perovskites containing (a) 4-aminopyridine and (b) pyridine

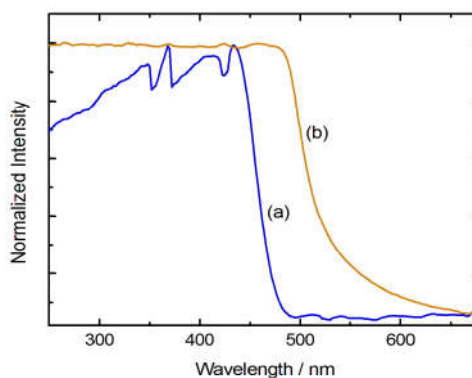


Figure 3. Absorption spectra of 1D perovskite crystals containing (a) 4-aminopyridine and (b) pyridine