

MS13 Structural Characterization of Functional Materials

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Crystal structure, characterization and physical properties of lead-free organic-inorganic hybrid perovskites
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Abstract

Organic-inorganic hybrid perovskites gain considerable attention recently and more studies have been done as changing the halide, metal ion or /and the ligand enables to tune the optical, electric, magnetic, ferroelectric and multiferroic properties. Halide perovskites in particular lead halides are interesting semiconductors with a direct band gap (1.5 eV) which enables collecting visible photons. These luminescent crystals have no future for safety and ecological reasons. Diammonium halide perovskite hybrids $[\text{NH}_3(\text{CH}_2)_n\text{NH}_3]\text{MCl}_x\text{Br}_{4-x}$; $x = 0, 2, 4$; $\text{M} = \text{Co}, \text{Mn}$; $n = 4-9$ allow mixing of organic and inorganic components in one molecule which possesses a property that may not exist in either of the parent components. The complete structure information as well as lattice parameters for Co series $n = 4-9$ are provided, and for $n = 3-6$ for Mn hybrid. Differential thermal analysis DSC shows reversible order - disorder transition for both the Co and Mn hybrids. Permittivity studies confirm the phase transition. The optical properties of Co series show strong absorption in the visible range, the band gap (1.73 eV) which is promising for photovoltaic applications.

References

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