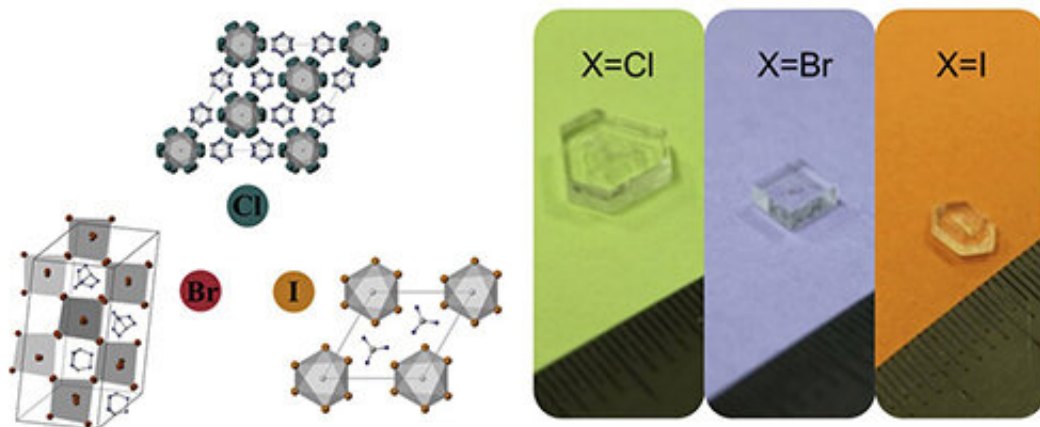
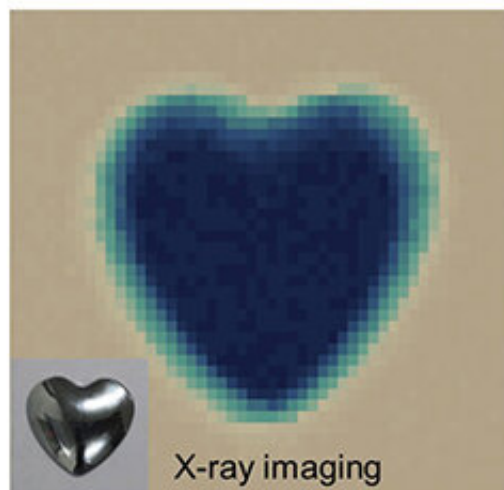
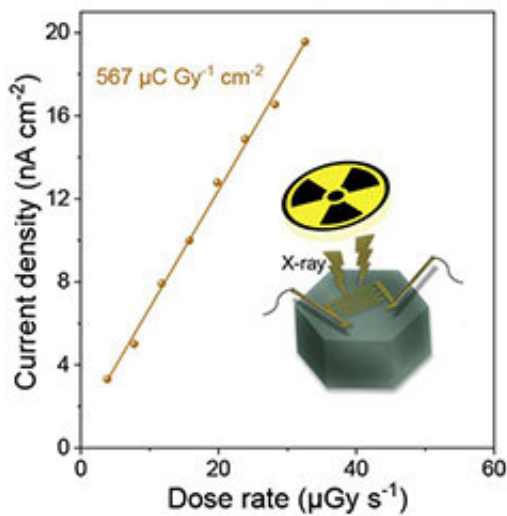


Researchers fabricate bio-friendly X-ray detectors based on metal-free perovskite single crystals

June 25 2021, by Li Yuan



Metal-Free Perovskites



Metal-free perovskite series, DABCO-NH₄X₃ (X = Cl, Br, I), exhibit a remarkable variety of perovskite-type structures through halide modulation,

therefore their single crystals grown at the same condition show different crystal morphology . Credit: DUAN Lianjie

Metal-free halide perovskites are novel candidates for ferroelectrics and X-ray detection. However, the molecular self-assembly of these perovskites and its influence remain unexplored.

Recently, a research group led by Prof. Liu Shengzhong from the Dalian Institute of Chemical Physics (DICP) of the Chinese Academy of Sciences (CAS) fabricated halide-modulated self-assembly of metal-free [perovskite single crystals](#) for bio-friendly X-ray detection.

This study was published in *Matter* on June 14.

Molecular [self-assembly](#) plays a critical role in crystal engineering for the design and fabrication of novel metal-free perovskite compounds.

After preparing DABCO-NH₄X₃ (X = Cl, Br, I) single crystals, the researchers investigated halide-modulated molecular assembly via hydrogen bonding in metal-free perovskites and its influence on their crystal packing, band nature, mechanical and electrical properties, as well as final optoelectronic performance.

They found that the crystal DABCO-NH₄I₃ with superior in-plane charge transport and lower charge effective mass exhibited higher carrier mobility. Therefore, it presented better X-ray detection sensitivity, reaching 567 $\mu\text{C Gy}_{\text{air}}^{-1} \text{cm}^{-2}$. Meanwhile, they demonstrated the feasibility of X-ray imaging had a well-defined 'heart' image.

A variety of non-metallic and organic groups readily were available for the A, B and X in crystal DABCO-NH₄I₃, resulting in fine-tuned

properties and free of associated toxicity.

"This work benefited the understanding of [molecular self-assembly](#) behavior and was intended to inspire activities to study an assortment of novel ABX₃ perovskite materials for potential biological and therapeutic applications," said Prof. Liu.

More information: Qingyue Cui et al, Halide-modulated self-assembly of metal-free perovskite single crystals for bio-friendly X-ray detection, *Matter* (2021). DOI: [10.1016/j.matt.2021.05.018](https://doi.org/10.1016/j.matt.2021.05.018)

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