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Optoelectronic Applications of Metal Halide Perovskites

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Over the past decade, metal halide perovskites (MHPs)—a novel class of water-soluble semiconductors with an exceptional combination of unique properties—have garnered significant attention for their potential in a wide range of optoelectronic devices. These include solar cells, detectors for optical and ionizing radiation, light sources, lasers, and various optoelectronic sensors.
As direct-gap semiconductors, MHPs offer high charge carrier mobility and confinement, along with the ability to tune their bandgap. This tunability enables the development of novel optical imaging arrays with up to three times the efficiency and resolution of current technologies, alongside superior color recognition and the elimination of geometric artifacts such as demosaicing [1].
The high atomic charge of MHPs, combined with their solution-processable nature, makes them particularly suitable for creating low-cost, efficient detectors for ionizing radiation. These materials allow for the combination of simple growth and deposition techniques for active layers with the ability to count single photons, making them highly effective for advanced detection applications [2-4].
Furthermore, MHPs'tolerance to defects in their electronic structure leads to a high quantum yield, making them ideal for next-generation dipoles. Additionally, their excitonic properties, present even at room temperature in low-dimensional films, open up possibilities for use in optical amplifiers and lasers [5].
In low-dimensional MHPs, the lattice's softness results in self-trapped excitons, which exhibit extreme sensitivity to external factors like temperature and pressure. This characteristic paves the way for developing high-performance phosphors for applications in thermography [6] and tensography.
The unique properties of metal halide perovskites make them highly promising materials for creating optoelectronic devices with advanced capabilities. Moreover, they offer exciting possibilities for inventing new types of sensors and functional devices with enhanced performance.
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Type of presence

Presence online

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