Research progress of lead-free perovskite solar cells

Can lead-based perovskite cells improve solar energy conversion?
Lead-based perovskite materials have drawn the attention of researchers around the globe. These cells have the potential to improve the efficiency of solar energy conversion,and they are being developed as a replacement for traditional solar cells (SCs).

Can lead-free non-toxic perovskite materials based solar cells solve the toxicity problem?
This review focuses on the development of lead-free non-toxic perovskite materials based solar cells and other devices. To solve the lead associated toxicity problem, lead can be substituted with nontoxic and environmentally friendly metals like Ti, Sn, Sb, Ge, Bi, and Ag.

Are green perovskite solar cells lead free?
The four groups of perovskite solar cells with the highest SLME values were all lead free. This study provides valuable insights for advancing the development of green lead-free perovskite solar cells with enhanced efficiency and stability. The development of functional materials serves as the cornerstone of industrial innovation.

Are lead-free perovskite photovoltaics a good back-up material?
Therefore, it is imperative to search and study the low-toxicity lead-free perovskites as back-up materials. Recently, encouraging progress is made on lead-free PSCs in terms of Sn perovskites and double perovskites. In this comment, we will summarize the present status and give future perspectives on lead-free perovskite photovoltaics.

Should we clean and remove lead from perovskite solar cells?
Because of the high toxicity associated with lead,it seems a pressing needto clean and remove toxic lead from currently available and future inorganic Perovskite solar cells. Environmental-health hazards are posed by lead-based compounds and devices available for use.

Can lead-free halide perovskites be used in solar cells?
Much work remains to be done in order to assess the potential of lead-free halide perovskites. For example, working solar cells based on Cs 2 BiAgBr 6 have not been reported to date. This is largely due to the difficulty in developing a synthetic route to obtain uniform thin films of the correct phase and composition.

Lead-free perovskite materials like Sn, Ge, Sb, Bi, their combinations, and other perovskite materials such as double perovskites are being explored for photovoltaic SC fabrication. Their advantages, stability, and ...

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Perovskite solar cells (PSCs) are undergoing rapid development and the power conversion efficiency reaches 25.7% which attracts increasing attention on their commercialization recently. In this review, we summarized the recent progress of PSCs based on device structures, perovskite-based tandem cells, large-area modules, stability, applications and industrialization. ...

Properties, opportunities and challenges existing in the substitute metals for lead in perovskite solar cells such as tin (Sn), germanium (Ge), titanium (Ti), silver (Ag), bismuth (Bi) and copper (Cu) and double perovskites has been discussed.

In this book chapter, we summarize material, dimensions, stability, and the current achievement of lead-free solar cells. Finally, we review the remaining challenges and ...

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In recent years, significant progress has been achieved in the field of perovskite solar cells (PSCs), particularly those comprised of organic-inorganic lead halides, resulting in a remarkable record efficiency of 25.20%. However, the persistent issue of lead toxicity poses a considerable barrier to their widespread commercial adoption. To address this ...

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Photovoltaics of organic-inorganic lead halide perovskite materials have made rapid progress in solar cell performance, surpassing the top efficiency of compound semiconductor solar cells such as CdTe and CIGS within a decade. Simple and inexpensive solution processes applied for perovskite preparation demonstrate the immense potential of ...

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