

Microscopic Insights into the Structural and Functional Properties of Organic Perovskite Materials and Devices

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Abstract

Perovskite materials have emerged as a focal point of research due to their exceptional optoelectronic properties and promising applications in photovoltaics, light-emitting diodes, and photodetectors. A thorough microscopic understanding of these materials is crucial for elucidating their intrinsic properties, defect dynamics, and interface behaviors. This paper offers a comprehensive review of advanced microscopic techniques utilized to investigate perovskite materials and devices, with a focus on their structural, morphological, and performance characteristics. The effects of synthesis conditions and electron beam-induced damage in TEM are specifically examined since they may change the actual nature of perovskite materials by causing structural deterioration, phase changes, and defect development. This paper highlights the advantages and limitations of these techniques, offering insights into optimizing imaging conditions to enhance the study of perovskites. Ultimately, improving synthesis methods, defect engineering, and imaging strategies is key to advancing perovskite-based optoelectronic devices.

References

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Figures

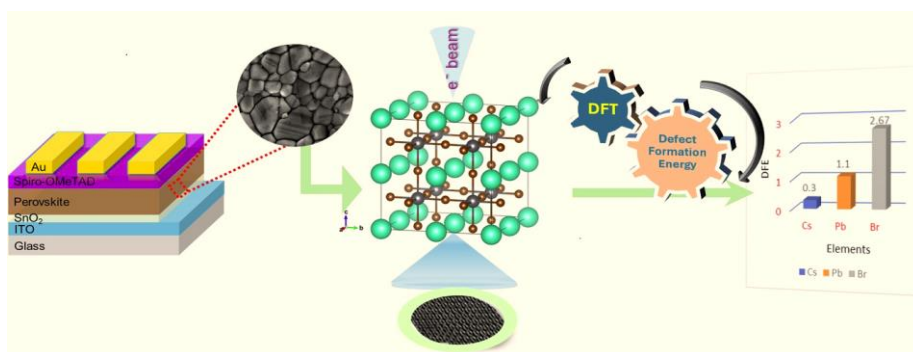


Figure 1: Integrated microscopy and DFT modeling of organic perovskite structure