RESEARCH ARTICLE

A Comprehensive Review of Perovskite Solar Cell Stability: Challenges and Solutions

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Abstract:

This comprehensive review examines the critical stability challenges facing perovskite solar cells (PSCs) and evaluates recent advances in addressing these issues. We analyze degradation mechanisms including moisture sensitivity, thermal instability, ion migration, and UV-induced decomposition. The review covers encapsulation strategies, compositional engineering, interface passivation, and device architecture innovations that have extended PSC operational lifetime from hours to over 10,000 hours. We identify remaining challenges and propose a roadmap for achieving the 25-year operational stability required for commercial viability.