

Device Modelling and Analysis of Eco-friendly Inverted Solar Cell Structure Using Valency Ordered Inorganic Double Perovskite Material

Authors : Sindhu S Nair, Atul Thakur, Preeti Thakur, Trukhanov Alex

Abstract : Perovskite-based absorbing materials that are organic, inorganic, or hybrid have gained interest as an appealing candidate for the development of solar cell devices. Lead-based perovskites are among the most promising materials, but their application is plagued with toxicity and stability concerns. Most of the perovskite solar cell consists of conventional (n-i-p) structure with organic or inorganic charge transport materials. The commercial application of such device is limited due to higher J-V hysteresis and the need for high temperature during fabrication. This numerical analysis primarily directs to investigate the performance of various inorganic lead-free valency ordered double perovskite absorber materials and to develop an inverted perovskite solar cell device structure. Simulation efforts using SCAPS-1D was carried out with various organic and inorganic charge transport materials with absorber layer materials, and their performance has been evaluated for various factors of thickness, absorber thickness, absorber defect density, and interface defect density to achieve the optimized structure.

Keywords : perovskite materials, solar cell, inverted solar cell, inorganic perovskite solar cell materials, cell efficiency

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