



Development of Photovoltaic Materials for High-Efficiency Solar Cells in Tropical Climates of Cape Verde

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Abstract

The tropical climates of Cape Verde present unique challenges for photovoltaic (PV) technology deployment due to high ambient temperatures and intense solar radiation. Experimental designs were conducted using computational models to predict material properties under extreme environmental conditions, followed by laboratory-scale synthesis and characterization of candidate materials. A novel perovskite compound was synthesized with a crystallization temperature range of 150-200°C, demonstrating photovoltaic activity that exceeded initial expectations in terms of stability and efficiency under tropical solar irradiance. The development of these advanced PV materials represents a significant step towards enhancing the viability of solar energy solutions within Cape Verde's climate zone. Further optimization efforts should focus on integrating these materials into practical solar cell architectures, with an emphasis on long-term stability and performance under continuous exposure to tropical conditions. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Cape Verdean, Photovoltaic, Polymers, Perovskites, Efficiency, Nanotechnology, Thermodynamics*

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