



Development of Photovoltaic Materials for Efficient Solar Cells in Burundi's Tropical Environment

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Abstract

The tropical climate of Burundi presents unique challenges for solar energy conversion due to high temperatures and intense sunlight. A multi-disciplinary approach combining computational modelling with laboratory experiments to optimise material properties for solar energy conversion. Initial simulations suggest an optimal bandgap of photovoltaic materials should be between 1.2 and 1.3 eV for maximum efficiency in Burundi's climate, based on a Monte Carlo simulation model. The study identifies key material parameters necessary for high-performance solar cells in tropical climates like Burundi's, with preliminary findings indicating an expected increase of 5% in cell efficiency over existing technologies. Further experimental validation is recommended to confirm the optimal material properties and to explore potential manufacturing processes. The empirical specification follows $Y = \beta_{0+\beta}^{-1} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Tanzanian, photonic, heterojunction, quantum, modelling, efficiency, biophysical*

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