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REVIEWER'S REPORT

Manuscript No.: **IJAR-52956** Date: 25-07-2025

Title: Cross-Influence of Temperature and Front Layer Thickness on the Performance of a Heterojunction Solar Cell

Recommendation:
Accept as it is .....YES.....
Accept after minor revision.....
Accept after major revision .....
Do not accept (*Reasons below*) .....

Rating	Excel.	Good	Fair	Poor
Originality		✓		
Techn. Quality			✓	
Clarity		✓		
Significance			✓	

Reviewer Name: **Mr Mir Bilal**

Reviewer's Comment for Publication.

Abstract Review:
The abstract presents a well-defined and technically sound summary of the study. It effectively communicates the scope, methodology, and key findings, focusing on the dual influence of temperature and FSF (Front Surface Field) layer thickness on heterojunction solar cell performance. The use of the TCAD SILVACO simulation environment is clearly mentioned, establishing the study's computational rigor. The description of trends in open-circuit voltage (V_oc) and short-circuit current density (J_sc) across FSF thickness variations is specific and logically explained. Mechanisms such as carrier recombination and field-effect passivation are discussed with clarity, and the performance implications for thin versus thick FSF layers are convincingly outlined. The conclusion emphasizes the importance of optimization strategies and environmental considerations, making the abstract both scientifically informative and practically relevant. The keywords are accurate and reflect the technical scope of the paper.

Introduction Review:
The introduction offers a solid overview of heterojunction solar cell architecture, particularly the p^+-a-Si:H / n-c-Si / n^+-a-Si:H trilayer structure. It contextualizes the significance of combining hydrogenated amorphous silicon and crystalline silicon in a photovoltaic framework. The description of this hybrid technology highlights its known strengths—efficiency and passivation quality—and acknowledges its established role in solar cell research. The writing maintains a professional and academic tone, and the reference to foundational literature supports the relevance of the investigation. The focus on FSF thickness and thermal effects is well justified within the broader technological and material science discourse.

Overall Assessment:
This paper demonstrates a clear and methodical approach to analyzing performance variables in

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heterojunction solar cells. Both the abstract and the introduction are logically structured and grounded in sound scientific principles. The integration of simulation-based analysis with theoretical insights on carrier behavior and passivation mechanisms adds depth to the investigation. The study addresses practical challenges relevant to the photovoltaic industry, including temperature sensitivity and material configuration optimization. The writing is precise, and the technical content is appropriately detailed for a specialized audience in materials science or photovoltaic engineering.