Highlights

Iron's impact on silicon solar cell execution: comprehensive modeling across diverse scenarios

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- Iron defect transformation impact on Si solar cells was studied via SCAPS simulation
- Variations in I_{SC}, V_{OC}, and η due to FeB decay allow estimation of iron contamination
- Short-circuit current variation is a key iron impurity quantification metric
- PCA is advisable step for estimating iron concentration using photovoltaic parameters