

IOWA STATE UNIVERSITY

Materials Science & Engineering Department

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Final Oral Examination
MS Student with Kristen Constant

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“Evaluating thermal imaging for identification and characterization of solar cell defects”

Solar cells have become a primary technology in today’s world for harvesting clean and renewable energy. Progress has been made towards improving the performance and quality of solar cells and reducing the cost. Both industry and researchers have done a lot of work in designing the solar cell structures, finding better materials for fabricating solar cells and studying the physics of solar cells. However, there remain challenges in fabrication and materials that degrade the performance of solar cells, one of which is the existence of shunts. Shunts have been broadly studied and are known to be common defects in solar cells reducing voltage, current, fill factor and efficiency.

The objective of this research is to develop a method to locate shunts with an IR camera, quantitatively define the extent to which the shunts affect the efficiency of solar energy conversion, and explore the nature of shunts. The system chosen for this work is one of the most common solar cell materials and structures, amorphous silicon solar cells. In this work, commercially available solar cells are used and prepared for study. IR inspection is then used to locate the shunts. Then electrical testing is performed to measure the characteristics of the solar cell. The shunts are then isolated. Then performance is tested once more to compare with previous data. Microscopy was used to explore the nature of shunts.