

## **Terahertz Spectroscopy of Photovoltaic Semiconductors**

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The terahertz (THz) band of the electromagnetic spectrum has long held interest in the science and engineering community for its unique applications in imaging and spectroscopy. However, due to the difficulty in generating and receiving THz radiation, only very recently practical and efficient THz systems become available. Due to recent advances in the development and manufacturing of commercially available THz spectroscopy and imaging system many of these applications are coming to fruition. As such, the practical implementation of THz in applications needs to be investigated in order to determine the advantages of THz technology.

In this work, THz spectroscopy of photovoltaic semiconductor devices will be performed throughout various critical stages in the fabrication process. Due to the few millimeter penetrating and non-destructive properties of THz radiation it will be possible to monitor semiconductor wafers using THz spectroscopy. This technology has a potential to provide insight into the development of wafer defects earlier in the fabrication process.

Using a pulsed Terahertz imaging and spectroscopy system at the University of Arkansas, our group will investigate the electrical properties of semiconductor photovoltaics and will conduct THz imaging of defected ones. Testing the wafers throughout various key steps in fabrication is a process known to produce a functional device. This will then be repeated for the same process, only now with a critical fatal defect such as a buried crack, surface crack or a defect in the doping level. These defects will be intentionally inserted at an early stage to determine if THz spectroscopy can be used to detect them early on. THz characterization of the semiconductors for the impurity doping levels and crystal orientation to be studied will be performed to determine the electrical properties in this frequency range. This will allow for accurate numerical simulation to compare with the experimental results.