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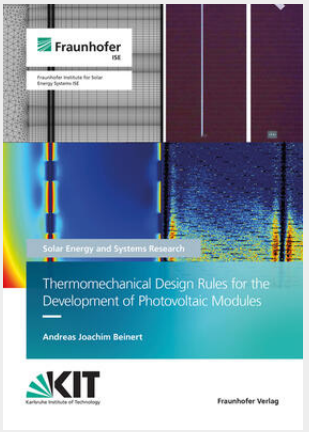
Thermomechanical Design Rules for the Development of Photovoltaic Modules.

Stress in solar cells plays a crucial role in the reliability of photovoltaic (PV) modules. The influences on stress are as diverse as the number of different materials in a PV module and become more and more complex with the growing variety of PV modules for different applications. Within this dissertation, a set of 15 thermomechanical design rules is derrived to support and accelerate future PV module developments. Three methods are developed and applied: 1. Thermomechanical finite element method simulations of PV module designs (FEM). 2. µ-Raman spectroscopy of laminated solar cells (µ-Raman). 3. Solar cell integrated stress sensors (SenSoCell®). Furthermore, the concept of specific thermal expansion stiffness: E ^_a=E·a·A_j·h is introduced as a measure of how much thermal strain one material can induce in another.



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