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Identification of electrical breakdown sites in multi-crystalline Si solar cells

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Device material quality effects both the efficiency and the longevity of photovoltaic (PV) cells. Therefore, identifying defects can be beneficial in the development of more efficient and longer lasting PV cells. In this study, a combination of spatially-resolved, non-destructive techniques, including; electroluminescence (EL), infrared (IR) thermography and light beam induced current (LBIC) measurements, were used to locate and classify junction breakdown defects and features in multi-crystalline Si PV cells. The focus of this study is the identification of sites of junction breakdown in the PV cells under reverse bias using both Reverse Bias EL (ReBEL) and reverse bias IR thermography. The understanding of the behaviour of junction breakdown is important when characterising failures that result when cells operate in the bias regime when severely mismatched. This type of breakdown can have detrimental effects in PV plants and the performance of an entire 20-module string can be negatively impacted by a single cell that is mismatched and hence operating in its reverse bias regime.

Keywords: EL, IR thermography, LBIC, junction breakdown. PV cell

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