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Temperature dependence of local electroluminescence parameters of crystalline Si Solar cells

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Electroluminescence imaging has been utilised in qualitative characterisation of photovoltaics devices since 2005. Since then, quantitative techniques have been developed. However, the temperature dependence of the emission-voltage response (equation 1) of photovoltaic devices has not been studied in-depth. This work investigates the temperature dependence of the proportionality constant and the luminescence ideality factor. These parameters are dependent on local material properties such as effective carrier lifetime and dark current density. Determining these parameters also allows for increased accuracy at determining local junction voltage at a given global voltage.

Local luminescence ideality factor, has been related to an injection-dependent carrier lifetime. Typically, in multi-crystalline solar cells, recombination-active grain boundaries correspond to non-unity luminescence ideality factor. This also corresponds to non-unity local bulk recombination ideality factors.
This paper discusses the experimental setup and analysis of bias-and-temperature dependent electroluminescence imaging. This paper presents the results of the applied technique on a crystalline Si sample and investigates the importance of local temperature correction in the determination of the luminescence parameters.

Apply to be
 considered for a student
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Yes

Level for award
 (Hons, MSc,
   PhD, N/A)?

PhD

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