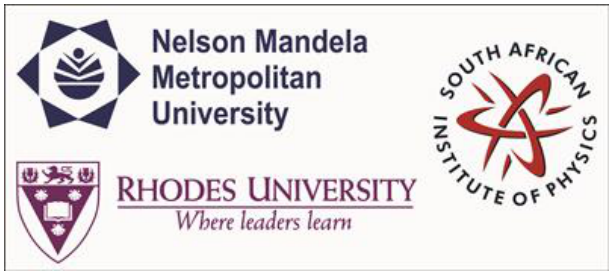

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Qualitative assessment of Photovoltaic modules using Electroluminescence

Thursday, 2 July 2015 11:10 (20 minutes)

Abstract content
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Electroluminescence (EL) is a useful characterisation technique as it is fast, non-destructive and allows defects in photovoltaic (PV) cells and modules to be identified. EL imaging is very effective in detecting cell defects in modules such as cracks, broken fingers and broken cells. In this paper an automatic identification routine for defects in cells in a module is discussed. An automatic defect identification algorithm that we developed is used to identify poorly performing cells and locate specific defects in mono-crystalline modules. The difficulties in defect identification in crystalline silicon modules other than mono-crystalline, such as multi-crystalline and EFG, are addressed. The cells in a module are sorted by comparing the binary image of each cell to a binary image of a cell in the module that does not show any EL identifiable features or defects. The sorting of cells depends on the parameters selected to define an “undamaged” cell. The sensitivity or area parameters of the algorithm can be adjusted so that smaller features are either considered or ignored. In modules with no apparent defects it is important to note the small features, while in a module with severe defects like large cracks and electrically isolated areas, small cracks and micro-cracks can be ignored as their effects are negligible. Common features such as broken fingers, striation rings have a shape and orientation that allows them to be identified. Micro-cracks can be very fine and easily missed in the image processing. However, once identified, the orientation and location can be determined which is a significant factor in determining the severity of the effect of the micro-crack on a module’s performance.

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