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Photon recycling in a solar cell with Lambertian surfaces

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An exact analytical expression for the probability of photon reabsorption and recycling in an idealized solar cell with Lambertian surfaces is derived. The existing approximations are found to agree with the exact formula to within a few per cent. The most accurate approximation turned out to be the simplest one that sets the reabsorption probability to the weak-absorption limit of the cell absorbance. The maximal photoconversion efficiency of a silicon solar cell is evaluated to be 29.5 % at the base thickness of 98 μm in a cell whose front and rear surfaces are Lambertian.

Keyword-1

silicon solar cells

Keyword-2

photon reabsorption

Keyword-3

photoconversion efficiency

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