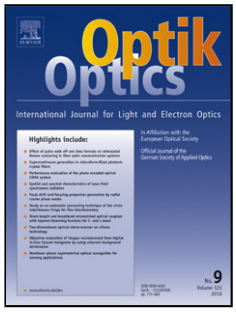

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Improvement efficiency of thin-film solar cell by plasmonic properties of silver

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Abstract

Thin-film silicon solar cells need light trapping mechanisms to enhance the efficiency due to silicon's weak absorption of light. In this paper, by use of rigorous coupled-wave analysis (RCWA), we propose and simulate a light-trapping quasi-photonic crystal plasmonic thin-film silicon solar cell consist of an anti-reflection coating (ARC) with refractive index n_{AR}=1.9 and thickness (T_{AR}=0.06 μm), a silicon active layer with thickness T_c =0.45μm, a grating surfaces composed of silver and a one-dimensional quasi-photonic crystal composed of SiO_2/Si layers. Results show that for proposed structure the cell efficiency arrive to 14.3% for TM with p=0.181μm and 11.71% for TE mode with p=0.42μm which has a significant increase compare usual and similar thin-film silicon solar cells.

Keywords: Thin film solar cell, silver Nano grating, anti-reflection (AR) coating, plasmonic effect.