



Iranian Journal of Physics Research, Vol. 20, No. 1, 2020

Absorption enhancement in thin-film silicon solar cells using hybrid blazed dielectric gratings and Nanoparticle structure

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(Received 14 August 2019 ; in final form 02 December 2019)

Abstract

In this paper, a two-dimensional structure of thin-layer silicon solar cells with a combination of silver nanoparticle arrays and a blazed grating is introduced. Applying Ag nanoparticles in the top surface of thin-layer solar cells improves the coefficient of light transmission into the active layer and photon absorption because of the resonance surface plasmon effect. By using the FDTD method, the transmittance and absorption of light at both surfaces is investigated. The effect of such structural parameters as radius, distance of nanoparticles, angle of blazed grating and the grating constant has been reported. Finally, both surfaces are combined and the weighted mean values of the light absorbed by active layer are calculated. The results show that the light trapping efficiency can be improved under specified combinations of the structural parameters.

Keywords: nanoparticle ,thin layer solar cells, gratings, surface plasmon effect

For full article, refer to the Persian section