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Enhancement in the Absorption Efficiency of GaAs/InAs Nanowire Solar Cells through a Decrease in Light Reflection

Authors : Latef M. Ali, Farah A. Abed, Zheen L. Mohammed

Abstract : In this paper, the effect of the Barium fluoride (BaF2) layer on the absorption efficiency of GaAs/InAs nanowire solar cells was investigated using the finite difference time domain (FDTD) method. By inserting the BaF2 as antireflection with the dominant size of 10 nm to fill the space between the shells of wires on the Si (111) substrate. The absorption is significantly improved due to the strong reabsorption of light reflected at the shells and compared with the reference cells. The present simulation leads to a higher absorption efficiency (Qabs) and reaches a value of 97%, and the external quantum efficiencies (EQEs) above 92% are observed. The current density (Jsc) increases by 0.22 mA/cm2 and the open-circuit voltage (Voc) is enhanced by 0.11 mV. it explore the design and optimization of high-efficiency solar cells on low-reflective absorption efficiency of GaAs/InAs using simulation software tool. The changes in the core and shell diameters profoundly affects the generation and recombination process, thus affecting the conversion efficiency of solar cells.

Keywords : nanowire solar cells, absorption efficiency, photovoltaic, band structures, FDTD simulation
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