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器件制备及器件物理

一种增加光吸收的非晶硅薄膜太阳能电池的设计

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摘要： 分别设计与优化了非晶硅薄膜太阳能电池的上表层和电池底部结构,采用严格耦合波方法(RCWA)数值计算了电池的光吸收。计算结果表明:在仅考虑TM偏振的情况下,优化后的增透膜与无增透膜相比,300~840 nm波长范围内的吸收平均提高了35%左右;优化后的背反射器与无背反射器相比,700~840 nm波长范围内的吸收平均提高了23%左右。该非晶硅薄膜太阳能电池结构在全角宽频范围内有较高吸收,可以提高太阳能电池的转化效率。

关键词： 增透膜 衍射光栅 光子晶体 吸收 太阳能电池

Design of An Amorphous Silicon Thin-film Solar Cell with Absorption Enhancement

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Abstract: The front-surface and the bottom of amorphous silicon(a-Si) thin-film solar cell are designed respectively. Light absorption is calculated by using the rigorous coupled wave analysis(RCWA). In TM polarization, the absorption of solar cells with optimized AR coating can be increased by an average of 35% compared with that without AR coating in the range of 300~840 nm. Furthermore, the absorption of solar cells with optimized back reflector can be increased by an average of 23% compared with that without back reflector in the range of 700~840 nm. The amorphous silicon(a-Si) thin-film solar cell that we design has broadband and omnidirectional absorption, so that it can improve the conversion efficiency of solar cells.

Keywords: antireflection coatings diffraction gratings photonic crystals absorption solar cells

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