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器件制备及器件物理

梯度掺杂对n型异质结太阳能电池性能的影响

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摘要： 通过仿真软件AFORS-HET对a-Si:H(p)/i-a-Si:H/c-Si(n)异质结太阳能电池的光伏特性进行分析及优化,主要对比了a-Si:H(p)层的均匀掺杂和表面掺杂浓度D_1=1×10^{20} cm^{-3}>界面掺杂浓度D_2=4×10^{19} cm^{-3}的梯度掺杂情况时的光伏特性,实现了在梯度掺杂时22.32%的光电转换效率。与均匀梯度掺杂相比,发射层的梯度掺杂除了引入一个附加电场,还优化了能带结构、光谱响应、表面复合速率。结果表明,梯度掺杂可以有效地改善电池的光电转换性能。

关键词： 梯度掺杂 光伏特性 能带结构 AFORS-HET

Enhanced Photovoltaic Properties of n-type HIT Solar Cell by Gradient Doping

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Abstract: In this paper, the analyzed and optimized of photovoltaic properties of a-Si:H(p)/i-a-Si: H/c-Si(n) heterojunction solar cell are simulated by the AFORS-HET software. Mainly compared the a-Si:H(p) uniformly doped layer and the surface doping concentration D_1 = 1×10^{20} cm^{-3} interface doping concentration D_2 = 4×10^{19} cm^{-3} gradient doping case of photovoltaic properties. The photovoltaic properties comparative and optimized were simulated by the AFORS-HET software. The conversion efficiency can reach 22.32% by gradient doping. Compared with the uniform-doping mode, the gradient doping not only introduced an additional electric field, but also optimized the energy band, spectral response and recombination rate. The simulation results show that the gradient doping can improve the photovoltaic performance of the solar cells efficiently.

Keywords: gradient doping photovoltaic performance band structure AFORS-HET

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