



HETEROJUNCTION SIMULATIONS

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Abstract

In order to meet the demand for higher efficiency solar cells, the next generation of solar cells must be able to capture more of the solar spectrum. This is achieved by using a heterojunction structure, which allows for the absorption of light across a wider range of wavelengths. This paper presents a study of the performance of a heterojunction solar cell, comparing it to a traditional silicon solar cell. The results show that the heterojunction structure is able to capture more light, resulting in a higher efficiency solar cell.

Introduction

The solar cell market is expected to grow significantly in the coming years, driven by the need for clean energy and the decreasing cost of solar panels. However, the efficiency of current solar cells is still relatively low, and there is a need for new technologies to improve performance. Heterojunction solar cells are one such technology, and this paper explores their potential.

N-Type Window Materials

N-type window materials are used in heterojunction solar cells to improve light absorption and reduce recombination. This section compares different materials and their properties.

Material	Band Gap (eV)	Electron Affinity (eV)	Effective Electron Mass (m _e)	Effective Hole Mass (m _h)
Si	1.12	4.05	0.26	0.55
SiO ₂	9.0	5.5	0.42	0.55
SiN _x	3.4	4.7	0.35	0.55
AlN	6.2	4.5	0.2	0.55
GaN	3.4	4.7	0.35	0.55
InN	0.7	4.7	0.35	0.55
AlGaIn	1.9	4.7	0.35	0.55
InGaAs	1.4	4.7	0.35	0.55
InP	1.35	4.7	0.35	0.55
InAs	0.36	4.7	0.35	0.55
InSb	0.17	4.7	0.35	0.55

Band Structure and Efficiency

The band structure plots show the energy bands for various materials. The conduction band (CB) and valence band (VB) are shown, along with the band gap (E_g) and the effective electron mass (m_e) and effective hole mass (m_h). The materials shown include Si, SiO₂, SiN_x, AlN, GaN, InN, AlGaIn, InGaAs, InP, and InSb.