

Use of CdS:O and CdSe as Window Layers for CdTe Photovoltaics

CdTe has established itself as the leading thin film PV technology and a performance of over 22% has been achieved. Traditionally CdTe PV have been limited by current loss due to the use of CdS as the device window layer, which has an optical band gap of 2.5 eV. Therefore, light with a wavelength of < 525 nm is lost due to absorption in the CdS. Recently devices utilising CdSe as an alternative window layer have been reported and have shown an increased response at short wavelength and enhanced device photocurrent. However, in order to maintain device performance a thin CdS layer is still required but these devices still suffer from other losses primarily the Fill Factor (FF).

In this work CdTe devices comprising of a CdS:O/CdSe dual window layer structure have been fabricated and characterised. Devices produced using a wider band gap (4.1 eV) CdS:O show increased photocurrent at short wavelengths and device performance is increased from 10% to 12%. Cells with an additional CdSe layer show evidence of a reduced band gap through the formation of $\text{CdTe}_{(1-x)}\text{Se}_x$ phases and increased collection at long wavelengths, the overall performance however, is significantly reduced. Due to the incomplete interdiffusion of the CdSe layer, devices show significant losses at short wavelengths, through optical absorption by the 1.7 eV CdSe film and a reduced V_{oc} due to poor interfaces.