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Semi-Transparent Bifacial SnS Solar Cell

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- A considerable amount of the electricity generated worldwide is used in buildings. Glazing in buildings has an important role since it provides natural light, view to the exterior, and separation from outdoor environment. The development of photovoltaic thin films solar cells envisages good potential for building applications in the form of glazing elements, especially in those buildings with large window to wall ratios or where there is not space for traditional bulk photovoltaic modules. This work is intended to develop a semi-transparent bifacial SnS solar cell aiming for a building integrated photovoltaics application by a proposed absorber layer sandwiched between a hole transport layer (HTL) and an electron transport layer (ETL) instead of conventional Zn(S,O) buffer layer. A few HTL (NiO) and ETL (such as CeO2, TiO2, FTO) have been investigated to pin down the optimal match.[1,2]
- SnS exhibits excellent properties needed to become a high-performance absorber material for thin film solar cells. Firstly, it has an absorption coefficient of 10^5 cm^{-1}, which is higher than other types such as CdTe [3] and minimizes the thickness needed to absorb the incident light to less than 1 μm [4]. Secondly, it has an optical bandgap of 1.35 eV, which is near the optimum value of 1.5eV for energy conversion [3]. Thirdly, SnS fabrication has a low thermal budget, since the deposition process requires relatively low process temperatures that do not exceed 500°C [4]. SnS TFSC also can be produced with low-cost deposition technologies [1]. Moreover, SnS has a low ionisation potential with a value of 4.7 eV, which is lower than CdTe and CZTS [3]. Last but not the least, SnS has the very high and attractive carrier mobility ~90 cm/V*s,[6] which is perfect for the propose structure with ETL and HTL.

References

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