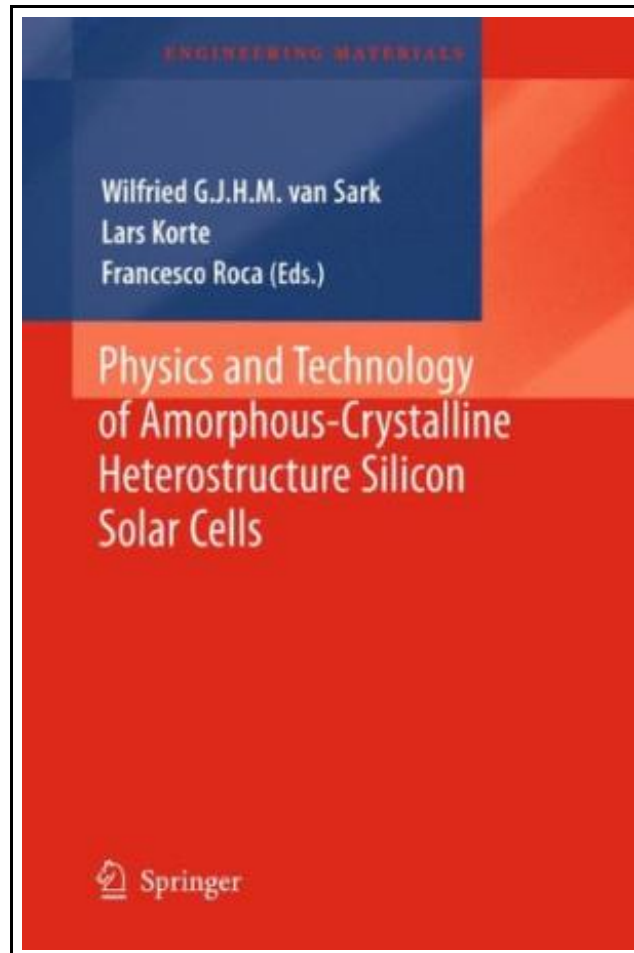


Physics and Technology of Amorphous-Crystalline Heterostructure Silicon Solar Cells



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(Norma Carroll)

PHYSICS AND TECHNOLOGY OF AMORPHOUS-CRYSTALLINE HETEROSTRUCTURE SILICON SOLAR CELLS



Book Condition: New. Publisher/Verlag: Springer, Berlin | Today's solar cell multi-GW market is dominated by crystalline silicon (c-Si) wafer technology, however new cell concepts are entering the market. One very promising solar cell design to answer these needs is the silicon hetero-junction solar cell, of which the emitter and back surface field are basically produced by a low temperature growth of ultra-thin layers of amorphous silicon. In this design, amorphous silicon (a-Si:H) constitutes both "emitter" and "base-contact/back surface field" on both sides of a thin crystalline silicon wafer-base (c-Si) where the electrons and holes are photogenerated; at the same time, a-Si:H passivates the c-Si surface. Recently, cell efficiencies above 23% have been demonstrated for such solar cells. In this book, the editors present an overview of the state-of-the-art in physics and technology of amorphous-crystalline heterostructure silicon solar cells. The heterojunction concept is introduced, processes and resulting properties of the materials used in the cell and their heterointerfaces are discussed and characterization techniques and simulation tools are presented. | Foreword.- Introduction.- Status of heterojunction solar cell R&D.- Basic features of Heterojunctions illustrated by selected experimental methods and results.- Deposition methods of thin film silicon.- Electronic properties of ultrathin a-Si:H layers and the a-Si:H/c-Si interface.- Degradation of (bulk and thin film) a-Si and interface passivation.- Photoluminescence and electroluminescence for a Si:H/c Si device and interface characterization.- Deposition and properties of transparent conductive oxides.- Metallization and formation of contacts.- Electrical and optical characterization of a-Si:H/c Si cells.- Wet-chemical pre-treatment of c Si for a-Si:H/c-Si heterojunctions.- Theory of heterojunctions and the determination of band offsets from electrical measurements.- Modeling and simulation of a Si:H/c Si cells.- Surface passivation using ALD Al₂O₃.- Introduction to AFORS-HET.- Hands-on experience with simulation tools.- a-Si:H/c-Si heterojunction and other high efficiency solar cells: a comparison.- Rear contact cells.- Progress in systematic...



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