Title: Photovoltaics: An overview of current and future solar cell technologies

Presenter:

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Abstract:

In this presentation, I will give an overview of the main technologies and materials currently used in the photovoltaic (PV) industry, as well as an overview of the main scientific challenges to further improve these technologies. In 2017, around 100 GW of PV panels were installed worldwide. More than 90% of these panels use crystalline-silicon wafers as the active solar cell absorber material. Hence, a big part of the presentation will deal with the current status and the main R&D challenges of crystalline silicon photovoltaics. Starting with an overview of the current silicon technology used in industry, I will highlight some ways in which the cell efficiency of crystalline silicon cell technology can be further enhanced, while simultaneously lowering the cost. Next to crystalline-silicon PV technology, I will also present the main alternative technologies used today, namely thin-film inorganic solar cells (such as chalcopyrites and kesterites) and hybrid organic-inorganic solar cells (perovskites). Finally, I will show that the theoretical and practical efficiency limits of single-junction silicon solar devices will ultimately be surpassed by going towards so-called tandem multijunction devices in which a high-bandgap thin-film top cell is placed on a crystalline silicon bottom cell.