

The stunning rise of perovskite solar cells

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ABSTRACT: Over the last 10 years perovskite solar cells (PSCs) have emerged as credible contenders to conventional p-n junction photovoltaics. Their certified power conversion efficiency currently attains 25.2 %, exceeding that of the market leader polycrystalline silicon. The lecture will present the recent evolution of this field which has produced over 15'000 scientific publications over a short time period. I shall discuss their operational principles and challenges that still need to be met to implement PSCs on a large commercial scale. PSCs can produce high photovoltages rendering them attractive for applications in tandem cells e.g. with silicon and for the generation of fuels from sunlight. Examples are the solar generation of hydrogen from water and the reduction of CO₂ mimicking natural photosynthesis.

BIOGRAPHY: Michael Graetzel is a Professor at Ecole Polytechnique Fédérale de Lausanne (EPFL) where he directs the laboratory of photonics and interfaces. He received his PhD from the Technical University in Berlin in 1971. After a postdoctoral training at the University of Notre Dame, USA, and his habilitation at the Free University Berlin he joined EPFL since 1977. He pioneered research on energy and electron transfer reactions in mesoscopic systems and their use to generate electricity and fuels from sunlight. He is credited with moving the solar cell field beyond the principle of light absorption via diodes to the molecular level exploiting the sensitization of 3-dimensional networks of semiconductor oxide nanoparticles by dyes, pigments or quantum dots for light energy harvesting. His dye-sensitized solar cells engendered the advent of perovskite solar cells, constituting the most exciting break-through in the recent history of photovoltaics. His recent honors and awards include the August Wilhelm von Hofmann Medal, the Global Energy Prize, the RussNano Award, the Zewail Prize for Molecular Science, the Global Energy Prize, the Millennium Technology Grand Prize, the Marcel Benoist Prize, the King Faisal International Science Prize, the Albert Einstein World Award of Science, the Paracelsus Medal of the Swiss Chemical Society, the Paul Karrer Gold Medal and the Balzan Prize. He is an elected member of the Swiss Academy of technical Sciences, the Leopoldina and other learned societies and holds eleven honorary doctor's degrees from European and Asian Universities. His publications received over 313'000 citations, h = 250 (Web of Science). A recent ranking by Stanford University places Graetzel in the first position on top of a list of 100'000 world-wide leading scientists across all fields.