

Dye-Sensitised Solar Cells Design, Function & Application

Neil Robertson,^a

^a*School of Chemistry, University of Edinburgh, Edinburgh EH93FJ, Scotland, UK*
e-mail: neil.robertson@ed.ac.uk

Tremendous advances have been made in photovoltaics (PV) in recent years, including in the development of emerging technologies such as perovskite PV, organic PV and dye-sensitised solar cells (DSSCs). These technologies can be applied to areas where silicon PV is not well suited, including power for consumer electronics, electromobility, building-integrated PV with attractive appearance, flexible, light-weight and semi-transparent PV, indoor energy scavenging and more. In some of these application areas, simplicity and low-cost for the devices can become as important as efficiency to achieve practical systems. DSSCs, based on mesoporous TiO₂ decorated with visible light-harvesting dyes, offer a promising choice for applications requiring low-cost indoor power generation for powering the emerging internet-of-things. However, standard designs include complex and costly sensitizers, alongside electrolytes that can be detrimental to stability and/or ease of fabrication. The presentation will focus on (i) an overview of the design and functionality of DSSCs, including many concepts relevant to PV in general and (ii) some of our recent work on TiO₂-mesocrystal synthesis, novel electrolyte components and effective low-cost dyes [1-5] towards more-readily fabricated and readily-scaled technology. Design and optimisation of the critical interactions between the nanocrystalline TiO₂, electrolyte and dye will be discussed.

References

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