

AperTO - Archivio Istituzionale Open Access dell'Università di Torino

## Electrodes and electrolytes for aqueous dye-sensitized solar cells

### This is the author's manuscript

*Original Citation:*

*Availability:*

This version is available <http://hdl.handle.net/2318/1882054> since 2022-12-06T11:46:09Z

*Terms of use:*

#### Open Access

Anyone can freely access the full text of works made available as "Open Access". Works made available under a Creative Commons license can be used according to the terms and conditions of said license. Use of all other works requires consent of the right holder (author or publisher) if not exempted from copyright protection by the applicable law.

(Article begins on next page)

## Electrodes and electrolytes for aqueous dye-sensitized solar cells

Lucia Fagiolari<sup>a</sup>, Matteo Bonomo<sup>b</sup>, Simone Galliano<sup>b</sup>, Guido Viscardi<sup>b</sup>, Claudia Barolo<sup>b</sup>, Federico Bella<sup>a</sup>

<sup>a</sup> Department of Applied Science and Technology, Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129 - Torino, Italy;

<sup>b</sup> Department of Chemistry, Università degli Studi di Torino, Via Pietro Giuria 7, 10125 - Torino, Italy.

Photovoltaic (PV) technology has evolved rapidly in the past few decades and now encompasses a large variety of materials and device structures. A key aspect to be considered in any PV technology is the operational durability under real outdoor conditions, as well as the sustainability of materials/components and the facile integration with energy storage systems.

In the last five years, dye-sensitized solar cells (DSSCs) with water-based electrolytes have been considered as one of the possible breakthroughs towards DSSCs large-scale diffusion. If opportunely developed and optimized, aqueous solar cells can be truly considered as zero-impact photovoltaic devices fabricated with non-toxic components [1,2,3,4].

We show here the possibility of jellying the electrolyte into a solid matrix to boost stability, the possible use of different redox mediators solvated by water, the formulation of TiO<sub>2</sub> pastes for screen-printable photoanodes operating in water, and the replacement of Pt cathodes with more sustainable alternatives.

Overall, we will show how much water-based photovoltaics represents a challenging topic in the current energy scenario, and how it will be able to provide safe, sustainable and easily processable solar cells for building-integrated photovoltaics and portable electronics.

*Politecnico di Torino is gratefully acknowledged by F.B. and L.F. for granting the fund named "Contributo ERC per chi ha superato il primo step di valutazione"*

[1] F. Bella, C. Gerbaldi, C. Barolo, M. Grätzel, *Chem. Soc. Rev.* **2015**, *44*, 3431.

[2] L. Fagiolari, M. Bonomo, A. Cognetti, G. Meligrana, C. Gerbaldi, C. Barolo, F. Bella, *ChemSusChem* **2020**, *13*, 6562.

[3] S. Galliano, F. Bella, M. Bonomo, G. Viscardi, C. Gerbaldi, G. Boschloo, C. Barolo, *Nanomaterials* **2020**, *10*, 1585.

[4] F. Bella, L. Porcarelli, D. Mantione, C. Gerbaldi, C. Barolo, M. Grätzel, D. Mecerreyes, *Chem. Sci.* **2020**, *11*, 1485.