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Structure–Performance Correlation of Nanocellulose-Based Polymer Electrolytes for Efficient Quasi-solid DSSCs


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Invited for this month's cover is the work of Dr. C. Gerbaldi and co-workers at Politecnico di Torino (Italy), in collaboration with the Istituto Italiano di Tecnologia. The cover image indicates the use of natural cellulose to improve photon uptake in quasi-solid dye-sensitized solar cells. The authors' tag-line is "back to cellulose for a sustainable futuristic energy ecosystem supply".
Read the full text of the article at 10.1002/celc.201402051.

What is the most significant result of this study?

Thanks to the use of truly natural nanoscale microfibrillated cellulose (NMFC) as an additive in the polymer electrolyte, the quasi-solid dye-sensitized solar cell (DSSC) is more efficient and durable than its liquid counterpart. Moreover, composite polymer electrolytes are prepared by free-radical photopolymerisation, which appears highly advantageous due to its easiness and rapidity in processing.

What was the biggest surprise?

Generally, the performance of DSSCs are improved by using expensive and aromatic additives, indeed, it was surprising to observe that NMFC can greatly improve both the photocurrent and the photovoltage. A thorough crystallographic and spectroscopic analysis highlighted the unique ability of NMFC to recover light (photons) and send it to the dye-sensitized electrode.

What are the main challenges in the broad area of your research?

As solar energy is a renewable energy resource with the most promising prospects, the ability to conceive and prepare efficient cells by means of cheap and green materials is a highly stimulating challenge. A hard and winding stairway is yet to be climbed on the pathway towards the development of a sustainable and oil-free large-scale energy supply system. However, based on the results presented in this work, we suggest that bio-sourced materials, which are readily available, low cost, and easily recyclable, represent a step forward for the next generation of high-performing, safe, and durable polymeric DSSCs.

Who designed the cover?

Graphical art was originally designed by Andrea Sanna, professional designer (info@andreasanna.net, www.andreasanna.net).

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