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Optimizing Hydrogel Electrolytes for Dye-sensitized Solar Cells

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Poster, Claudia Barolo, 270

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In this contribution, an investigation on bio-derived hydrogel electrolytes for dye-sensitized solar cells is proposed.

When opportunely developed and optimized, aqueous solar cells can be considered a truly low impact photovoltaic device with non-toxic components [1,2,3]. Moreover, the possibility of gelling the electrolyte into a polymeric matrix can reduce the leakage outside the device, thus increasing the long-term stability. Above all, bio-derived polymers appear promising being renewable and easy available with low cost [4]. Different aqueous electrolytes gelled with carboxymethylcellulose (Na-CMC) or xanthan gum have been prepared with both I-/I³⁻ and Co²⁺/Co³⁺ redox mediators. These gelled systems show good photovoltaic performances, maintaining over 90% efficiency of liquid DSSCs, as well as enhanced long-term stability.

Moreover, we demonstrate the use of Experimental Designs (DoE) as a powerful chemometric technique for the concurrent investigation of a number of experimental factors that directly influence the photovoltaic performances of solar cells. Results obtained enlighten that a solid mathematical-statistical approach is fundamental to support the researchers and effectively drive the experiments towards the achievements of optimal operating conditions for aqueous solar cells [5].

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[3] Bella, F.; Galliano, S.; Falco, M.; Viscardi, G.; Barolo, C.; Grätzel, M.; Gerbaldi, C. *Chem. Sci.* 2016, 7, 4880-4890

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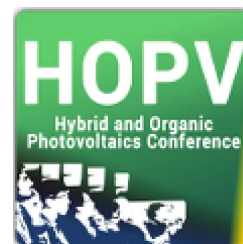
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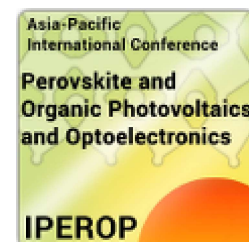
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