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Development of photochromic photosensitizers for a new generation of solar cells with dynamic optical properties

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Among emerging photovoltaic technologies, Dye-Sensitized Solar Cells (DSSCs) have already demonstrated power conversion efficiencies (PCEs) over 15%, and good stability with lifetimes over 10 years. These devices can be colourful and semi-transparent, which makes them very appealing for Building-Integrated Photovoltaics (BIPV).^[1] However, for integration as windows, a trade-off has often to be found between transparency and efficiency.^[2]

In this communication, we will present our work aiming at developing photochromic dyes specifically designed for use in photovoltaic devices. We will present the synthetic routes to access to these photochromic photosensitizers and we will detail their optoelectronic properties. We will show that we can use them to fabricate a new generation of semi-transparent solar cells and modules capable of self-adjusting their optical transparency and their photovoltaic energy conversion as a function of light intensity.^[3-4-5] (Figure 1)

The structure-properties relationships of this new class of functional photosensitizer will be discussed and we will present strategies to improve their coloration-discoloration kinetics, optical properties and photovoltaic performances.^[6-7]

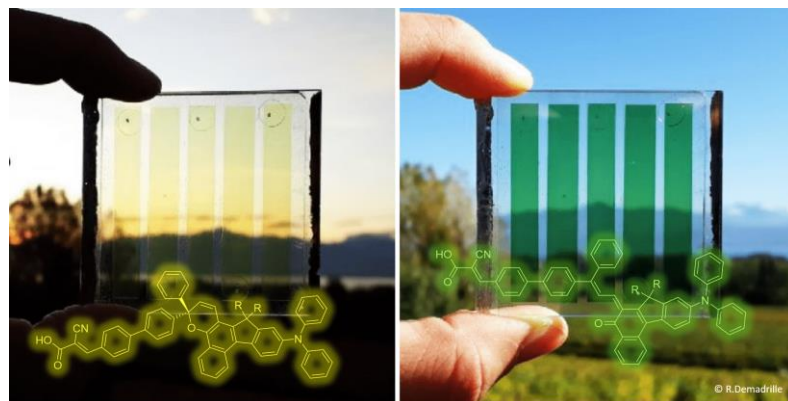


Figure 1: Example of 23cm² mini-module based on a photochromic dye under various sunlight conditions (developed in collaboration with Solaronix Company)

Keywords: Photochromic dyes, Dye-sensitized solar cells, Photovoltaics

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