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Chimie Et Interdisciplinarité Synthèse, Analyse, Modélisation
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Conférence – CEISAM – UMR CNRS 6230

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Salle Marie Curie

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"Is dye-sensitized solar cells a dying field ?"

Further strengthen by the recent achievement of 14.3 % power conversion efficiency by combining a cobalt (+III/+II) redox mediator with two organic sensitizers,[1] the credibility of dye-sensitized solar cells (DSC) as a silicon alternative has never been as unequivocal as today. Nevertheless, the recent progresses in OPV and DSC are totally outshined by a "new" solar cell technology based on halide perovskite for which the conversion performances reached beyond 20 % in a period of only four years development, getting together OPV and DSC main key players devoted to this research field and consequently bringing a shadow onto these two former technologies. For very long time, the DSC field mainly concentrated on development of new dyes to reach the grail of panchromatic absorption and on the mesostructuration of the anatase TiO_2 to enhance the charge collection efficiency, with final aim to score new records in power conversion efficiencies. Turning towards new redox couples than iodine/iodide have been in reality the most effective realization. In this panorama, much less attention has been paid on electrolyte whereas it contributes to both efficiency and stability against IEC61646 standard ageing protocol, and, even much less towards understanding the chemical interactions and electrochemical degradation mechanisms in the device to prolong the device life-in-time using specifically developed chemical compounds and additives. One example will be given of a specifically developed new iodide molecule which enhances both device stability and device performance in comparison to the benchmark 1,3 di-alkyl-imidazolium iodide. In this seminar, against another preconceived idea that the most stable DSC constituent is TiO_2, we will discuss that it is probably the (or one of the) worst. We will describe how the exposed surface of this latter to electrolyte plays in reality a significant role on the electrolyte degradation and on the device operating during ageing. A second part of the presentation will be dedicated to another grail: the NIR conversion which has the potentiality to offer unprecedented perspectives of colorless and transparent photovoltaic devices. Our recent effort devoted to the development of efficient organic squaraine and cyanine dyes and their integration into practical "efficient" device will be discussed.
Is dye-sensitized solar cells a dying field ? We will leave you judge of the answer…, though the scientific and technological perspectives have never been that eminent…

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