PARTNER SEARCH FORM

Proposal/Expertise title:
Please add your project title or a title to explain your expertise

Flexible polymer/oxide solar cells with modified oxides for long-lasting solar cells

Partner search type:
Indicate if you would like to propose a specific project and are looking for partners to form a consortium, or if you are interested in joining a consortium and like to describe your company's expertise.

☒	Project Proposal	☒	Company Expertise

Programme(s) and activity areas:
Select the European Commission programme acronym(s) and Activity Areas in which you are interested in participating (f.ex. FP7, FP7-ICT, FP7-NMP, CIP, etc.)

PF7 - Energy

Partner search deadline:
(dd/mm/yyyy)

Text

Description of proposal or expertise:
Enter a brief text (up to 1900 characters) describing the proposal or the organization's expertise offered on this occasion. Any technical abbreviations should be expanded at the first occurrence, with the abbreviation following in parenthesis. Subsequently, the abbreviations alone may be used

Polymer/oxide solar cells*. Application of conducting organic polymers and semiconductor metal oxides in organic polymer/oxide solar cells. The solar cells' active interface can be made as blends of polymers and the oxide thus application on flexible substrates is possible. We look for partners to optimize the technology which is in an early stage of research.*

Description: Hybrid solar cells (HSC) are also known as hybrid polymer solar cells], organic–inorganic hybrid solar cells, hybrid polymer metal oxide photovoltaics or, more recently, as a type of the inverted polymer solar cells. In these solar cells the active layer is made by the direct interfacial connection between an inorganic semiconductor (TiO_2, ZnO, $Nb_2 O_5$, CdSe, CdS, etc.) and organic semiconductors (small molecules, conducting polymers or similar) and can be find as bi-layers, nanostructured or as bulk heterojunction configurations. In a basic configuration, the inorganic semiconductor works as the electron transport material (ETM) and the organic semiconductor as the hole transport material (HTM). Their power conversion efficiencies have reached more than 2% applying ZnO or CdS nanoparticles. These efficiencies, together with the ease of their fabrication and the low cost of their counterparts, make them highly promising systems. Nevertheless, there is an imperative need for solar cell efficiency improvement and, even more important, device lifetime enlargement. Lifetime studies on these and similar systems have been deeply studied by several laboratories. Back in 2006, we demonstrated that in HSC applying semiconductor oxides, both components, the oxide and the polymer, are susceptible to reversible oxygen intake. The semiconductor oxide presents a light-driven oxygen release and exchange mechanism with the atmosphere, whereas the polymer displays the formation of a reversible charge transfer complex (CTC) with oxygen. Under longer and continuous light irradiation in air the CTC presents singlet-oxygen formation and the irreversible degradation of the polymer with time is shown to be inevitable. These processes indicate that oxygen is required for photovoltaic performance, jeopardizing the possibility to enhance the stability of the solar cell (of the organic semiconductor) by its encapsulation under inert atmospheres. As an advantage, several works have demonstrated the application of semiconductor oxides in what is called air-stable solar cells where the interaction with air is a requisite for proper operation. Nevertheless, working under inert atmospheres is indispensable in order to safeguard the long-term stability and lifetime of any organic semiconductor (e.g. polymers) and therefore to improve the lifetime of HSCs. The need to understand semiconductor oxide behavior goes beyond HSCs systems since semiconductor oxides are increasingly being applied in different optoelectronic devices like polymer solar cells, tandem and stacked organic solar cells, organic light emitting diodes (OLEDs) or field effect transistors where sealing under inert atmosphere is needed.

Our Expertise: We can modify semiconductor oxides (e.g. TiO_2) by doping with different metal ions and apply them in polymer/oxide solar cells to work under N_2 atmospheres or encapsulated environments. The solar cells have been analyzed under continuous irradiation conditions under N_2 by means of solar decay, IV-curves and *in-situ* IPCE analyses at different periods of time. We compared the results with the behavior observed for polymer/oxide solar cells applying the bare TiO_2 oxide and we found that, contrary to the unmodified oxide, it is possible to work under inert atmospheres when the modified oxide is applied. Moreover, our results show a delicate interplay between photovoltaic properties and doping level. Doping with large amounts of ions, beyond solubility limit within TiO_2, results in the co-existence of alien species of oxide which, in turn, seems to improve even more the stability of HSC under N_2 atmosphere.

Our equipment for solar cell fabrication, characterization and testing: Sun simulator (calibrated for 1.5AMG), kethley multimeters, cell holder for control of temperature, humidity, light irradiation and in-situ IPCE analyses. Furnaces spin coaters, thermal evaporator, IPCE analyses.

Partners skills and competencies that you seek:

Enter a clear text (up to 1900 characters) describing the skills and competencies your requested Partners should have.

Basic research: We need partners able to pursue basic characterization of the solar cells like charge mobility, time constant measurements, impedance analyses, etc.

Scale up: We look for partners able to fabricate solar cell devices on large scale by roll-to-roll or printing techniques.

Partners sought in the following countries:

List the preferred target partners' country(ies)

Text

Partners already acquired

Text

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