NEW SOLAR CELLS FOR A MORE EFFICIENT ENERGY

- **Research produced entirely in the Basque Country between Polymat, Ikerbasque and IK4-CIDETEC and financed by the Basque Government, represents a turning point in the field of solar cells based on perovskites**.

- **This is an innovative technique known as "Fullerene Saturation Approach" that achieves energy conversion efficiencies similar to or higher than existing ones and significantly reduces energy costs hence further facilitating marketing.**

- **The publication has been rated as a VIP (Very Important Paper) by ChemSusChem magazine, a category reserved for highly innovative research, which has been long awaited for by the scientific community and leads to a new theory or mechanism.**

Solar energy is probably the best alternative to using fossil fuels, since the Earth receives in just one hour all the energy that the entire world population requires for a whole year. The challenge ahead is to be able to efficiently transform all that solar energy into electrical energy. An investigation produced entirely in the Basque Country between Polymat, Ikerbasque and IK4-CIDETEC is a turning point in technology that will achieve this challenge.

Currently more than 85% of the photovoltaic market corresponds to modules based on silicon wafers that show energy conversion efficiencies of around 15%. This technology still has a high cost in comparison to conventional methods of producing electricity and the efficiency energy conversion certainly needs to be improved.

In recent years, solar cells based on perovskites -clasified by the prestigious Science magazine among the 10 most significant scientific breakthroughs in 2013- have shown great potential, achieving energy conversion efficiencies in excess of 22%. However, some of the proposed materials still present some limitations, especially in terms of robustness and are therefore susceptible to improvement.

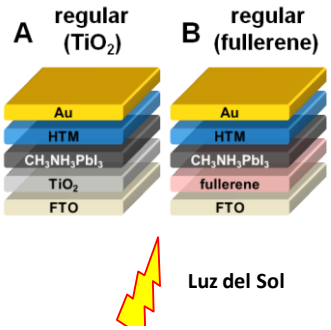

Figure 1 - Different solar cells mentioned in the text.

Among the usual components of a perovskite solar cell, is (Figure 1, A) an electron transporting layer that blocks positive charges (gaps)- Titanium dioxide (TiO2) -, CH3NH3PbI3 hybrid perovskite -material able to capture sunlight-, and another gap transporting layer and electron blocker- Spiro MeOTAD organic material -.

The titanium dioxide used in these cells requires a thermal process called "sintering" at high temperatures (~ 500°C), which implies high-energy costs and thus hinders future commercialization of these solar cells. In addition, these temperatures are incompatible with the use of plastic substrates and its advantages for the development of easily integrated photovoltaic devices.

In research conducted by researchers from Ikerbasque, Polymat and IK4-CIDETEC and published by the ChemSusChem journal, a simple, inexpensive and innovative technique is proposed which involves the use of Fullerenes in solution instead of Titanium Dioxide (Figure 1. B). By means of this innovative technique, known as the **"Fullerene Saturation Approach"**, efficiencies similar to or higher than those built with Titanium Dioxide conversion are achieved, avoiding the high energy costs associated with the sintering process.

Additionally, the use of the **"Fullerene Saturation Approach"** allows for the use of chemicals such as [70] fullerene, which a priori, does not meet the processability, optical and electronic requirements needed to achieve efficient devices. Contrary to expectations, devices generated with [70] fullerene show similar efficiencies to those described for cells built with Titanium Dioxide, which enables the possible introduction of a variety of organic molecules that had been initially discarded because of their optoelectronic properties.

Finally, the solar cell manufacturing technology by means of wet fullerene chemistry, allows for the preparation of flexible devices, which could be incorporated on any surface.

All these advantages make this research funded by the Basque Government through the "Solutions" PC2015-1-03 (16-79) project and carried out in collaboration between Polymat, Ikerbasque and IK4-CIDETEC, a turning point in the field of solar cells based on perovskites. Parts of these results were recently published in the journal ChemSusChem "Efficient Regular Perovskite Solar Cells Based on Pristine (70) Fullerene as Selective Electron Contact" ChemSusChem **2016**, DOI: 10.1002 / cssc.201600051 and rated with the distinction of "Very Important Paper (VIP) "

http://onlinelibrary.wiley.com/doi/10.1002/cssc.201600051/full

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