



MATERIALS FOR A BETTER LIFE ...  
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## **New technological advances for the third generation of Solar cells**

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Imagine a world where each family residence produces the energy it consumes at lower prices than today's. Imagine a world with free CO<sub>2</sub> residence energy, more sustainable and more integrated into the natural world. This is the promise of building integrated photovoltaics (BIPV).

Perovskite solar cells (PSC) are a new comer in the field of photovoltaic cells – in 2009 the best device has an energy efficiency of 3.8 %; in 2019 a top efficiency of 23.7 % was reached! No other photovoltaic technology evolved that fast. More recently, results on tandem silicon-perovskite solar cells indicate power conversion efficiencies of 27.3 % by Oxford PV, already very close to 30 % which is the target of companies operating in this topic.

A PSC is ca. 1  $\mu\text{m}$  thick and the light absorber layer, an organic-metal perovskite semiconductor, is just ca. 400 nm thick! PSCs are made of abundant materials and can be produced easily, incorporating a minimal amount of energy and natural resources; they promise to revolutionize again the photovoltaic world. PSCs should quickly evolve for more local and tailor made production rather than centralized very large plants such as for crystalline and polycrystalline silicon photovoltaic cell. Some critics point out the presence of lead in the perovskite composition. However, its concentration is rather small, in the range of 0.1 wt.% of the active layer.

The stability and reproducibility of PSC improved tremendously as a result of the recent developments. Research is now focusing on producing encapsulated modules with high power conversion efficiencies and stabilities. Actually, for moving to BIPV PSCs have to display stabilities of 25 years or more and featuring leak free encapsulation. Probably the best encapsulation approach is glass sealing. However, temperature stability constrictions require that the sealing process temperature do not overcome 120 °C and preferably 85 °C. This is a quite demanding requirement which was only recently developed.

A review of the PSC critical developments will be provided, focusing on the latest developments concerning PSC modules, structuration, glass encapsulation and performances.

Presenting author: please, insert your full address and contact details (times new roman 12pt – normal)

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