

Study of TiO₂/Graphene-based nanocomposites for perovskite solar cells: Synthesis and Properties

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► **To cite this version:**

Nathalie Herlin-Boime, Johann Bouclé, Pr Ratier, Raphaëlle Belchi, Aurélie Habert. Study of TiO₂/Graphene-based nanocomposites for perovskite solar cells: Synthesis and Properties. FIM-PART'17, Jul 2017, Bordeaux, France. cea-02341953

HAL Id: cea-02341953

<https://hal-cea.archives-ouvertes.fr/cea-02341953>

Submitted on 31 Oct 2019

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Abstract FIMPART 9-12th July 2017

ID: 26/Oct/18/29/33/PP1968

Topic: Materials for Energy

Study of TiO₂/Graphene-based nanocomposites for perovskite solar cells: Synthesis and Properties

Since 2012, hybrid solar cells based on perovskite materials demonstrated several significant advances, with power conversion efficiencies now up to 22%, attracting strong interest within the scientific community. Still, efforts remain to be performed to improve photo-current generation, especially concerning the development of efficient and reliable charge transporting electrodes and selective contacts.

We recently demonstrated a significant increase in efficiency for solid-state dye-sensitized solar cells by incorporating carbon nanotubes in the TiO₂ mesoporous electrode. In this context, the use of composites based on TiO₂ nanoparticles and carbon nano-objects is a relevant strategy towards more efficient electron collection, if interfacial properties between both components can be finely tuned. Taking benefit from specific know-hows on both perovskite solar cell processing (state-of-the-art efficiencies) and production of specific nano-scaled materials, we aim at developing high quality TiO₂/carbon-based nanocomposites for an optimal energy conversion in perovskite solar cells.

The first line of our current research is the synthesis and optimization of TiO₂/graphene based-nanocomposites, using the original technique of laser pyrolysis, in order to achieve well-controlled physical properties suitable for efficient and stable cells. Particular attention is paid to synthesis conditions and correlated materials as well as final solar cells properties. Our presentation will be then focused on the nanocomposites characterization such as morphological and structural analysis, TiO₂/graphene interface analysis, physical properties evaluation and their role and effects within perovskite solar cells.

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