

Energy Nanomaterials

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There are multiple and varied challenges to allow for our inexorable transition to a sustainable energy model, a model that will include new ways of generating, storing, distributing, managing and consuming energy. These new ways are already emerging but they need a definitive boost to prevail. Science and Technology, and in particular Nanoscience and Nanotechnology are bound to provide great and many contributions to the consolidation of these emerging technologies.

At ICN2 we are actively working on many fronts related to nanomaterials for energy conversion, storage and efficiency and will present here an overview of these efforts, including next-generation fotovoltaics,[1,2] high-performance lithium batteries and fast-charging supercapacitors, [3,4] biogas production,[5] materials for fuel cells,[6, 7] for thermoelectric energy harvesting[8] as well as materials for energy saving.[9]

All of them examples of how to walk the steep way that goes from nanometers to terawatts.

1. Vertically-aligned nanostructures of ZnO for excitonic solar cells: a review

Gonzalez-Valls, Irene; Lira-Cantu, Monica. EN & ENV SCI 2 (1) 19-34 2009

2. Low-temperature, solution-processed, layered V₂O₅ hole-transport layer for organic solar cells

Teran-Escobar, Gerardo; Pampel, Jonas; et al. EN & ENV SCI 6(10) 3088-3098 2013

3. Hybrid Energy Storage: The Merging of Battery and Supercapacitor Chemistries.

Dubal, D.P.; Ayyad, O.; Ruiz, V; Gomez-Romero, CHEM SOC REV in press 2014

4. Stable graphene-polyoxometalate nanomaterials for application in hybrid supercapacitors

Suarez-Guevara, J; Ruiz, V; Gomez-Romero, P PHYS CHEM CHEM PHYS 16(38) 20411-20414 2014

5. Programmed Fe₃O₄ Nanoparticles Disintegration in Anaerobic Digesters Boosts Biogas Production

Casals, Eudald; Barrena, Raquel; Garcia, Ana; et al. SMALL 10(14) 2801-2808 2014

6. Proton-conducting Poly-benzimidazoles for high-temp PEM fuel cells. A chemical quest

Asensio, J. A; Sanchez, Eduardo M.; Gomez-Romero, Pedro CHEM SOC REV 39(8) 3210-3239 2010

7. Deposition and characterisation of epitaxial oxide thin films for SOFCs

Santiso, Jose; Burriel, Monica. J SOLID STATE ELECTROCHEM 15(5) 985-1006 2011

8. Nanostructured p-type Cr/V₂O₅ thin films with boosted thermoelectric properties

Loureiro, Joana; Santos, Joao R.; Nogueira, Adriana; et al. J. MAT CHEM A 2(18) 6456-6462 2014

9. Liquid-Filled Capsules as Fast Responsive Photochromic Materials

Vazquez-Mera, N; Roscini, C; Hernando, J; et al. ADV OPT MAT 1(9) 631-636 2013