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Nanofluids for energy applications

Nanofluids are homogeneous dispersions of nanoparticles in conventional base fluids which constitute an emerging type of unique liquid materials within the field of Nanoscience and Nanotechnology. They have been proposed and used for a variety of applications with very special emphasis on thermal properties and heat-transfer applications. Indeed, solids present better thermal conductivity and specific heat capacities than liquids but dispersing solid micro particles in fluids leads to clogging, a problem which is solved with nanoparticles. On the other hand, other energy-related applications are possible for nanofluids which have not been explored until very recently. In our group we are developing two different research lines dealing with nanofluids i) nanofluids for thermal applications and ii) Electroactive Nanofluids (ENFs) for energy storage in novel flow cells. The latter type includes a wide variety of nanofluids containing nanoparticles able to store electrical energy, whether through redox or capacitive mechanisms. We will present an overview of the use of nanofluids in the field of energy, from thermal to electroactive nanofluids with some final focus on our own recent results, including the first example of the application of ENF materials for the development of fast energy storage in flow cells. In this case, we have used a capacitive nanofluid based on graphene which would be the flow-cell analog of solid-electrode graphene supercapacitors.

Biography

Pedro Gomez-Romero has completed his PhD in Chemistry from Georgetown University, USA in 1987 with Distinction. He served as a Full Professor and Group Leader of NEO-Energy lab at ICN2 (CSIC), Sabbatical at the National Renewable Energy Laboratory, USA (1998-99), Vice-director of MATGAS Technological Center (2010-2013) and leads projects on nanomaterials for energy storage and conversion (lithium batteries, supercapacitors, graphene, flow batteries, solar-thermal energy, nanofluids). He is author of more than 200 publications, scientific editor of the books "*Functional Hybrid Materials*" P Gómez-Romero, C Sanchez (Eds.) (Wiley-VCH 2004) and "*Metal Oxides in Supercapacitors*" (Elsevier, 2017, D Dubal, P Gomez-Romero) (in preparation) and author of three award-winning popular science books. He is member of MRS, ECS, ISE, EuroScience and the Royal Society of Chemistry and Fellow of the Royal Society since 2014.

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