

## CLEAN AND SUSTAINABLE ENERGY: THE ROLE OF CARBON NANOSTRUCTURES

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This presentation provides an overview of nanocarbons (nanotubes, onions ,nanodiamonds, nanographites, dendrimers) for the assembling of efficient, sustainable devices for energetics. Carbon at the nanoscale offers an alternative approach to develop inherently safe chemistries and material nanoarchitectures and therefore represents a new paradigm for the fabrication of nanotech efficient energy-related systems. NanoShare Srl has achieved during the last decade a wide expertise in designing and preparing carbon-based nanomaterials able to overcome the limitations of conventional materials in energy-related applications. Nowadays NanoShare offers low-cost and scalable manufacturing solutions for the use of carbon nanostructures as effective materials in components and devices for energy generation and storage.

Some examples of ecofriendly efficient technologies developed by NanoShare:

- *Solar Cells* - The business strategy of NanoShare is the design and production of specific nanomaterials for the realization of :
  - photo-electrodes: transparent, conductive, flexible layers formed by carbon nanotubes (CNT) embedded in conductive polymers or arrays of TiO<sub>2</sub>-coated CNT.
  - counter-electrodes: CNT membranes enriched by graphene platelets - CNT nocomposites
- *Supercapacitors* - The emphasis is on combining nanomaterials for the simultaneous fulfilment of performances and costs:
  - cathodes: polymers/nanodiamonds; anodes: hybrid materials: CNT/onions/dendrimers
  - separators: bucky papers formed by assemblies of CNT
- *Li-ion batteries* - The focus is on the development of manufacturing solutions to improve cell efficiency, by coupling C and Si in the anode material:
  - design of mutual Si/C organization and new architectures to improve charge and ion transport

The R&D activities allowed NanoShare to physically validate the basic separate components and moreover to integrate them in prototypes for lab functional testing. All the activities in course are made taking into account the target application scenario and the requirements for industrial production , the challenging task is to bridge the gap from research to manufacturing.