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## ABSTRACT

### **New concepts and materials in the nano regime: challenges and exploration in the energy field**

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The use of nanotechnology and the development of nanoarchitectures do not lead to a simple transformation of scientific concepts from the microscale to the nanoscale but enable new and unexpected concepts. In the first part of the presentation, the main and relevant examples of technological solutions in the nano regime will be reported to highlight the most interesting emerging concepts applied for the harvesting and the conversion of light and heat. Nanomaterials, nanodevices, as well as high-tech-driven strategies of nanomanipulation will be reviewed to introduce and contextualize the science and technology efforts dedicated to this topic and the invited talks, as well. In the second part, the most important works of the presenter will be shown to introduce some of the challenges in the energy field, from the periodic nanotexturing of diamond induced by ultra-short laser treatments for the solar radiation harvesting, to the development of thermionic components in hybrid devices for the thermal energy conversion, going through the fabrication of thin-film thermoelectric architectures or nano-plasmonic diamond-based devices for photo-electrocatalytic applications.