

ABSTRACT:

Innovative Nanomaterials for Solar and Thermal Energy Conversion

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The transition toward a sustainable energy future requires the development of advanced materials capable of improving the efficiency, stability, scalability, and affordability of next-generation energy technologies. Nanostructured materials have emerged as key enablers for solar and thermal energy conversion due to their unique optical, electronic, thermal, and catalytic properties, which can be tailored through precise control of composition, morphology, and architecture. This special session focuses on recent advances in the design, synthesis, characterization, modelling, and application of innovative nanomaterials for renewable energy generation, conversion, and storage.

Particular attention will be devoted to nanomaterials for advanced photovoltaic technologies, including perovskite, hybrid, and organic/inorganic solar cells, as well as materials for solar fuel production through photocatalytic and photoelectrochemical processes, water splitting, and fuel-cell-related applications. Contributions addressing thermal-to-electric energy conversion will be of paramount importance, encompassing thermoelectric, thermionic, pyroelectric, electrocaloric, and thermal management materials and devices. Especially thermoelectric, thermophotovoltaic, and thermionic energy converters and their hybridization will be discussed in detail.