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ABSTRACT:

Nanotechnology for Materials and Devices Applied to Solar and Thermal Energy Conversion

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Thermal-to-electric conversion stands as the cornerstone of modern industrial economies. Although thermomechanical engines have traditionally served as the standard energy converters, they suffer from significant limitations in scalability, maintenance requirements, and degradation over time. In contrast, solid-state thermal-to-electric converters offer steady performance without moving parts, ensuring long lifetime and minimal maintenance needs. Moreover, they are fully scalable, with efficiency levels largely unaffected by size variations. In the last few years especially in nanotechnology and nanomaterials there has been a notable surge in interest and effort devoted to the research and development of solid-state thermal-to-electric materials. This focus revolves around the advancement of materials and the creation of innovative conversion devices operating across a spectrum of temperatures.

Special Session 3 of NANOSMAT 2024 is geared towards engaging the rapidly expanding communities developing materials, structures, and concepts in thermoelectrics, thermionics, and thermophotovoltaics, alongside the more established fields of novel photovoltaic technologies and concentrated photovoltaics. The special session aims to foster discussion and collaboration, particularly on hybrid concepts that emerge from the evolution of the aforesaid technologies. A special emphasis is placed on exploring the growing range of applications in industrial energy recovery, solar energy conversion, aerospace propulsion, and all the other applications needing power control and management with solid-state devices.