Special Issue

Advanced Materials for Intelligent Nanophotonics: AI-Driven Reconfigurable Metasurfaces in Nonlinear and Quantum Regimes

Message from the Guest Editors

The extraordinary optical properties of nanophotonic materials, such as extreme light confinement, nonlinear enhancement, and quantum emission, have been theoretically established for decades.

Conversely, more complex capabilities remain underutilized in practical devices despite their theoretical promise. Recently, the integration of artificial intelligence with nanophotonics has fundamentally transformed this landscape. Physics-Informed Neural Networks (PINNs) now enable inverse design of nanostructures, while deep learning frameworks predict optical responses of complex meta-atoms with unprecedented accuracy.

Critically, these AI methodologies have demonstrated an unprecedented capability to manipulate light–matter interactions at subwavelength scales, enabling functionalities once considered impractical.

This Special Issue aims to comprehensively review recent advancements in AI-driven nanomaterial design for nonlinear and quantum nanophotonics. We welcome all contributions including full papers, communications, and reviews.

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Materials (ISSN 1996-1944) was launched in 2008. The journal covers twenty-five comprehensive topics: biomaterials, energy materials, advanced composites, advanced materials characterization, porous materials, manufacturing processes and systems, advanced nanomaterials and nanotechnology, smart materials, thin films and interfaces, catalytic materials, carbon materials, materials chemistry, materials physics, optics and photonics, corrosion, construction and building materials, materials simulation and design, electronic materials, advanced and functional ceramics and glasses, metals and alloys, soft matter, polymeric materials, quantum materials, mechanics of materials, green materials, general. *Materials* provides a unique opportunity to contribute high quality articles and to take advantage of its large readership.

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