Scanning

# Special Issue on
# Artificially Designed Two-Dimensional Quantum Materials

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CALL FOR PAPERS

Quantum metamaterials are artificially designed structures exhibiting strong quantum properties and functionalities not found in nature-made systems. The examples of such artificially produced structures are atomic assemblies and nanoscale lithographic patterns designed using scanning tunneling microscopy (STM), self-assembled nanowire arrays on miscut substrates, layered van der Waals (vdW) heterostructures with tunable intercalation gaps, and oxide heterostructures with interfacial 2D electron gas. These systems exhibit tunable electronic and optical properties useful for quantum information processing, hyperspectral optoelectronic applications, spectroscopic chemical detection, and ultra-high-density nonvolatile memory storage. Scanning microscopies, including STM, AFM, NSOM, SEM, and HRTEM, have been shown to be of the utmost importance in design and characterization of 2D quantum metamaterials.

This special issue will publish high-quality manuscripts related to fabrication, experimental characterization, and theoretical modeling of tunable artificial quantum materials with a strong focus on real-space imaging of various quantum properties. Such quantum properties typically involve charge distributions, spontaneous ordering and symmetry breaking phenomena, electron interference and quantum size effects, Mott-Hubbard transitions, probe-surface interactions, nanoscale magnetism, many-body condensates, and so on.

Potential topics include but are not limited to the following:

- Atomic scale STM lithography on metal and semiconductor substrates
- Imaging subsurface dopant atoms and controllable placement of dopant atoms into ordered structures using scanning probes
- Self-assembled 2D structures and nanowire arrays designed by tuning the substrate miscut angle
- Oxide heterostructures with tunable 2D electron gas
- Controllable design of tunable 2D vdW heterostructures by means of controllable layer stacking and/or controllable interlayer intercalation
- Bioinspired design methods incorporating, for example, tunable-length DNA fragments
- Theoretical models and computer simulations of artificial quantum materials with emphasis on prediction (or interpretation) of scanning microscopy data
- Advanced scanning probe instrumentation methods particularly useful for design and characterization of quantum metamaterials. The examples may include design of extra-long-lifetime probes for STM nanolithography, combining STM and AFM with optical pump-probe techniques, and ultra-sensitive detection using STM (like detection of phonons)

Authors can submit their manuscripts through the Manuscript Tracking System at https://mts.hindawi.com/submit/journals/scanning/adtd/.

Papers are published upon acceptance, regardless of the Special Issue publication date.

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