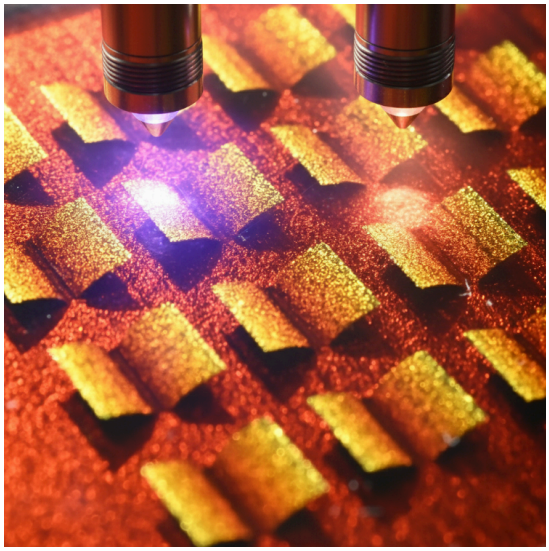
IEEE AP-S Antennas and Propagation Society
IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION

IEEE TAP Special Issue

Emerging Materials and Enabling Technologies for Advancing Antenna Systems: From Design to Manufacturing



In recent years, novel materials, processes, and manufacturing technologies have emerged with significant potential for advancing antenna systems in wireless communication. Over the past two decades, there has been a growing interest in new microwave materials and fabrication methods, which facilitate the development and innovation of antennas, metasurfaces, and metamaterials across the megahertz (MHz) to terahertz (THz) frequency range. However, there is no such special issue in IEEE Transactions on Antennas and Propagation (TAP). To address this gap, a Special Issue on New Materials and Processing Technologies for Antenna Designs and Wireless Communication is necessary, offering an excellent platform for cross-disciplinary researchers and practitioners to share the latest developments in antenna designs inspired by advanced materials and emerging manufacturing technologies. The Special Issue will also provide a forward-looking perspective on future antenna designs that leverage advanced materials and intelligent manufacturing technologies to address the integration of emerging wireless paradigms (such as 6G, IoT, and electromagnetic skins), sustainability and green fabrication, and the increasing impact of AI-driven design and optimization.

The scope of this TAP Special Issue covers emerging RF/microwave materials and fabrication processes with significant potential to advance future developments in antenna innovations, propagation, and electromagnetic wave manipulation, utilizing high-performance RF materials and processing technologies. This interdisciplinary field unites researchers, scientists, and engineers from diverse backgrounds to promote and explore novel materials, processes, and manufacturing techniques. It also offers opportunities for the AP-S community to share cross-disciplinary R&D efforts and findings. Submissions may encompass, but are not limited to material engineering, chemical engineering, mechanical engineering, automation, and process engineering.

Topics of interest: We invite high-quality submissions addressing topics including, but not limited to:

Additively Manufactured Antennas and Arrays:

- Additive Manufacturing techniques for antenna fabrications, such as inkjet and screen printing, fused deposition modelling (FDM), continuous liquid interface production (CLIP), and selective laser sintering (SLS), etc.
- Dielectric materials for antenna designs: Low-loss materials, high dielectric constant materials, phase-changing materials
- Metallic materials for antenna designs: steel, silver, copper, and alloys
- Multimaterial 3D printing, e.g. dielectric and conductive materials
- Bioprinting for nanoantennas

Emerging Fabrication and Processing Techniques for Antennas:

- Intelligent antenna manufacturing systems with AI
- Ultra-precision machining: laser micromachining and electro-discharge machining (EDM) with improved accuracy for prototyping nano antennas or photonic conductive antennas (PCA)
- Hybrid manufacturing for complex antenna systems: additive and subtractive hybrid processing
- Materials coating techniques for high-performance antenna systems
- Multimaterial antenna fabrication
- Nano/micro processing techniques for miniaturized antennas
- Heterogeneous integration and processing techniques for antenna-in-package and chip-to-chip communications

Functional RF Materials for Reconfigurable Antennas:

- Shape-memory materials for reconfigurable antennas: Shape-memory alloy and shape-memory polymer
- Electromagnetic absorbing materials/magnetic materials for frequency-selective surfaces and absorbers
- Phase-tunable materials for beamforming, beam steering and beam shaping
- Magnetic materials and multiferroics for advanced antenna systems
- RF materials formulation
- Tunable RF materials stimulation/modelling techniques
- Material training/stimuli strategies: Electrical, heat, light, magnetic waves
- Next generation of semiconductor materials for on-chip antennas

Materials and Enabling Technologies for Antenna Characterization and Applications:

- Material characterization and measurement methods of the new material
- Biomedical, medicine and healthcare applications
- Electromagnetic skins
- Emerging wireless applications such as 6G and IoT
- Wireless power transfer
- Satellite antenna systems and space applications

Emerging wireless paradigms with advanced materials and intelligent manufacturing technologies:

- Antenna design using sustainable and green fabrication technologies
- AI-driven design and optimization

Supporting Technical Committees

- TC-8 (Leading): Wireless Communication
- TC-1 (Supporting): Antennas
- TC-2 (Supporting): Arrays
- TC-4 (Supporting): Metamaterials
- TC-7 (Supporting): Antenna Measurements
- TC-11 (Supporting): Health & Medicine
- TC-12 (Supporting): Space

Data and Code Sharing

All authors are invited to share via IEEE Data Port and IEEE Code Ocean the used data and developed codes to enhance the reproducibility and visibility of the articles published in the Special Issue.

Keywords

- Additive manufacturing
- RF/microwave materials
- Antenna fabrication
- Metamaterials and metasurfaces
- Reconfigurable antennas
- Multimaterial processing
- Nano/Microfabrication
- AI-driven design
- Sustainable manufacturing
- 6G wireless systems

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Important Dates

Submission deadline: 31 October 2026