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Editorial

Special Issue on the Progress and Application of Electromagnetic Materials

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Electromagnetic materials refer to materials that can manipulate electromagnetic waves, which can control the amplitude, phase, polarization, spectrum, and other characteristics of electromagnetic waves. In addition to natural materials, the research on artificial electromagnetic materials, also known as metamaterials, has also received extensive attention from researchers in recent years. Metamaterials refer to a kind of artificially structured media composed of periodically or non-periodically arranged subwavelength unit cells, which have exotic electromagnetic properties beyond the limits of naturally occurring materials. Metamaterials have shown significant applications in invisibility cloaks, lenses, antennas, etc. Metasurfaces, the two-dimensional counterpart of metamaterials, have garnered increasing attention recently. Metasurfaces have been widely reported with various functions, such as anomalous refraction, polarization conversion, vortex beam generation, holographic imaging, etc. To date, electromagnetic materials, including metamaterials and metasurfaces, have shown great potential in wireless communication, data storage, energy conversion, and biological and medical sensing and imaging.

This Special Issue is dedicated to a broad collection of expert views and articles on a wide range of topics including the design, simulation, fabrication, experimentation, and various applications of various electromagnetic materials.

A total of six research papers in various fields of electromagnetic materials, including piezoelectric electret mechanical antenna, metasurfaces, mie-metamaterials, and analytical approaches for metamaterials, are presented in this Special Issue. Shuopu Wang et al. [1] proposed a novel speech communication system based on a piezoelectric electret mechanical antenna, which provides real-time speech communication with a user-friendly design, high compatibility with different communication devices, and easy customization to meet specific requirements. Yuan Fu et al. [2] designed a grating-like terahertz reflective-type metasurface for terahertz beam manipulations based on a frequency scanning mechanism, and it possesses the potential for applications in terahertz beam steering and beam-splitting devices. Fei Yang et al. [3] designed a compact programmable coding metasurface with PIN diodes to realize beam steering in the Ka band, and it may have potential applications in sensing and wireless communications in millimeter waves. Hongya Wu et al. [4] incorporated a metamaterial structure into concrete using steel reinforcement and dielectric cubes to improve the electromagnetic wave absorption performance of concrete. Giovanni Angiulli et al. [5] elaborated on the mathematical foundations of an algorithmic approach that can avoid the branch ambiguity problem, and it presented a simple variant of the above algorithm for exploiting the intimate relationship between the K–K relations and the Hilbert transform. Giovanni Riccio et al. [6] developed an analytical approach for evaluating electromagnetic scattering from a planar complex object composed of a perfect electric conductor, and it can host a double-negative metamaterial half-layer on the lit face.

Although submissions for this Special Issue have been closed, research on the subject of electromagnetic materials undoubtedly contributes to addressing the growing requirements in advanced technologies, such as high-speed wireless communication, big data storage, and highly sensitive biological and medical sensors.

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