Special Issue

Novel Low-Dimensional Material-Based Photodetectors for Sensing and Imaging Applications

Message from the Guest Editors

In recent years, low-dimensional materials—including quantum dots (QDs), nanowires (NWs), and two-dimensional (2D) materials—have emerged as revolutionary building blocks for next-generation photodetectors. One-dimensional nanowires offer directional charge transport and enhanced light trapping, which are ideal for high-speed and polarization-sensitive devices. Meanwhile, 2D materials (e.g., graphene, transition metal dichalcogenides, and MXenes) combine ultrahigh surface-to-volume ratios with mechanical flexibility, thereby opening avenues for wearable sensors and ultrathin imaging arrays. Beyond conventional photodetection, these materials are driving innovations in emerging fields such as in-sensor computing, neuromorphic optoelectronics, and photonic logic circuits, where light detection and signal processing converge at the device level. This Special Issue aims to highlight cutting-edge advances in low-dimensional material-based photodetectors and computational methods for their transformative applications in sensing, imaging, and integrated photonic systems.

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