Special Issue

Hybrid and Scalable Nanofabrication Methods for Low-Dimensional Materials

Message from the Guest Editors

Low-dimensional materials (LDMs) are nanomaterials in which charge carriers or atomic structures experience spatial confinement in at least one dimension. Notable examples of LDMs include graphene, hexagonal boron nitride (h-BN), transition metal dichalcogenides (TMDs), and quantum dots. Owing to their distinctive quantum confinement effects, large surface-to-volume ratios, and exceptional electronic/optical properties, LDMs have become pivotal for applications such as electronic devices, optoelectronics, energy storage, and catalysis. The development of advanced fabrication techniques for LDMs represents a critical research area in nanotechnology. Current studies center on overcoming the challenge of simultaneously achieving high precision, scalability, and reproducibility in nanomanufacturing. Emerging solutions employ hybrid methodologies that synergistically combine top-down approaches (e.g., lithographic patterning) with bottom-up processes (e.g., chemical vapor deposition). These innovative hybrid fabrication strategies not only improve material quality and device performance, but also enhance industrial viability through cost-effective, scalable production.

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