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Special Issue Reprint

Advances in Carbon Nanotubes

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Carbon nanotubes (CNTs) have remained at the forefront of nanoscience over the past three decades due to their unique cylindrical structures and exceptional physical, chemical, and mechanical properties. Significant progress has been achieved in their synthesis, structural control, and integration into a wide range of applications. More recently, advances in artificial intelligence and machine learning have introduced powerful data-driven approaches to CNT research, enabling the precise optimization of synthesis conditions, an improved understanding of growth mechanisms, and the predictive design of tailored nanostructures. This reprint highlights recent advances in CNT research, encompassing synthesis and structural engineering, the translation of properties from nanoscale to macroscopic systems, and application-oriented developments. Key topics include the precise control of CNT growth, interfacial interactions, and scalable fabrication strategies, as well as the fundamental understanding of electrical, thermal, and optical properties and their correlation with structure. The reprint also covers emerging applications in sensing, composites, nanoelectronics, and biomedical fields, alongside recent progress in durability, multifunctional integration, and hybrid materials. In addition, it addresses the growing role of artificial intelligence and machine learning in accelerating synthesis optimization, property prediction, and materials design, reflecting the evolving landscape of CNT research.

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