High-Efficiency Synthesis of Carbon Nanotubes Empowered by AI

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Carbon nanotubes (CNTs) have attracted significant attention due to their outstanding mechanical properties, excellent thermal and electrical conductivity, and good chemical stability. However, carbon nanotube powders produced by traditional chemical vapor deposition (CVD) methods typically consist of a mixture of various structures, making it difficult to precisely control their morphology. Recently, artificial intelligence (AI) technology has opened new avenues for the direct fabrication of high-quality, high-purity CNT powders. By constructing an AI-driven framework based on "mechanism-guided design—scheme development—performance prediction—experimental verification," and using data to establish growth models for CNTs combined with theoretical calculations, the controlled growth process of high-purity CNT powders can be effectively optimized. This approach breaks through the limitations of traditional methods. Therefore, the integration of AI with automated CNT fabrication systems is expected to accelerate the industrialization of CNT materials.

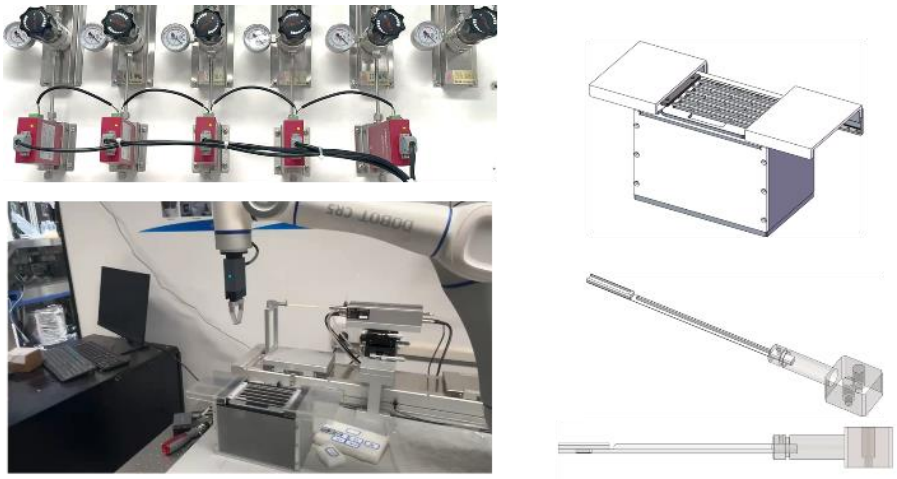

Figure 1. AI empowered automated CVD system for synthesis of carbon nanotubes.