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Large-scale synthesis of high-quality double-walled carbon nanotubes by catalytic decomposition of Benzene

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Double-walled carbon nanotubes (DWNTs), which consist of two concentric cylindrical graphene layers, have many advantages over other types of carbon nanotubes (CNTs) in electrical and mechanical properties. Especially, DWNTs can offer excellent field emission properties, which have low threshold voltage for electron emission as single-walled carbon nanotubes and high emission stability similar to mutiwalled carbon nanotubes.

High-quality DWNTs have been synthesized by catalytic decomposition of Benzene over supported catalyst. DWNTs have the inner tube diameters in the range of 0.69-2.53 nm and the outer tube diameter in the range of 1.44 - 3.30 nm. The interlayer spacing between graphene layers is ranged from 0.35 - 0.38 nm. Transmission electron microscopy and Raman analysis show that produced carbon materials have low defect level in the atomic carbon structure, indicating the synthesis of high-quality DWNTs. Our results demonstrate that benzene is a very ideal carbon feedstock to synthesize high-purity DWNTs over Fe-Mo / Al_2O_3 catalyst.