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Synthesis and Characterization of high-quality single-walled carbon nanotubes by catalytic decomposition of Acetylene

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Single-walled carbon nanotubes (SWNTs) are expected to exhibit unique electronic, and mechnical properties, which might lead to a variety of new application. To exploit these properties it is necessary to optimize their yield and quality. Catalytic Chemical Vapor Deposition method appears as a promising technique for scaling-up the production of Carbon Nanotubes at a relatively low cost.

High-quality SWNTs with few defects and very small amount of amorphous carbon coating have been produced by catalytic decomposition of C_2H_2 over a MgO-supported Fe-Mo bimetallic catalyst at 800 ℃. As-synthesized carbon materials mainly consist of SWNT bundles with a diameter of 16-30 nm and cover overall catalyst surface. The diameters of SWNTs are in the range of 0.8-2.43 nm from Raman analysis. Raman analysis and high-resolution transmission electron microscopy observation indicate that as-synthesized SWNTs possess high quality. Our results demonstrate that acetylene is a very ideal carbon feedstock to synthesize high-purity SWNTs over Fe-Mo / MgO catalyst.