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Position-Controlled, Rapid Growth of Single-walled Carbon Nanotubes[1] D. STYERS-BARNETT, Z. LIU, C. M. ROULEAU, H. CUI, D. B. GEOHEGAN, Oak Ridge National Lab, Oak Ridge, Tennessee 37831-6031, A. A. PURETZKY, Department of Materials Science and Engineering, University of Tennessee, Knoxville — 'Fast-heating' chemical vapor deposition (CVD) is a proven approach for the growth of long individual single-walled carbon nanotubes (SWCNTs). However, obtaining insights into how fast a carbon nanotube can grow is still of scientific and technical importance. Here, we describe a new CVD technique to synthesize SWCNTs using laser irradiation as the heat source. By adjusting the laser conditions, the heating time can be precisely controlled. Additionally, using a laser provides localization of the thermal energy, allowing position controlled growth. Temperature profiles of the substrate, measured by fast, in situ optical pyrometry, show controlled heating to CVD temperatures in a few seconds. Growth rate, yield, and diameter distribution of SWCNTs vary dramatically depending on catalysts, feedstock gases, and heating profile parameters, indicating this laser-CVD technique may provide local control over growth conditions and may pave a way for investigating the growth mechanism of 'fast-heating' carbon nanotubes.

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