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Ethanol-promoted growth of dense vertically aligned small-diameter carbon nanotubes YONGYI ZHANG, University of Michigan, JOHN GREGOIRE, Cornell University, JOHN HART, University of Michigan — We report the use of a small concentration of ethanol in addition to ethylene as the carbon source for growth of vertically aligned CNT "forests." In our system, adding ethanol promotes the catalyst lifetime from approximately 20 minutes to nearly 60 minutes, and accordingly increases the forest height from 2.5 mm to over 5 mm, with CNT diameters of approximately 5 nm (2-3 walls). Spread composition films deposited by gradient sputtering, combined with non-destructive mapping of CNT diameter and alignment by small-angle X-ray scattering, enable high-throughput discovery of necessary and sufficient conditions for growth of small-diameter CNTs. Compared with the widely known water-assisted "super growth" process, we find that ethanol enables much finer control of the dewpoint and thus offers more consistent and tunable results. Also, ethanol is a weaker oxidant than water and therefore creates fewer structural defects due to unwanted etching of the CNT walls.

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