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Coated Carbon Nanotube Scaffolding as a Cheap Alternative to Deep Si Etching DAVID HUTCHISON, BRENDAN TURNER, ROBERT DAVIS, RICHARD VANFLEET, Brigham Young University — Deep silicon etching is a process to create high aspect ratio vertical structures. It requires expensive equipment and is chemically specific to Si. We demonstrate a cheaper, easier, and more general method of creating comparable structures. Vertically-aligned carbon nanotubes (VACNTs) are grown using chemical vapor deposition (CVD) into high aspect ratio structures. The spaces between nanotubes are then filled with various materials by low-pressure CVD. To date, we have filled in our structures with Si and amorphous carbon, achieving features down to $1\mu\text{m}$ in size, but this method also appears generalizable to a wide variety of materials. The VACNT structures are grown from a patterned, evaporated Fe film on a diffusion barrier layer. Using transmission electron microscopy, we show that without the barrier layer, during annealing, the Fe forms a silicide with the underlying silicon so that it cannot work effectively as a catalyst for nanotube growth. The effectiveness of various barrier layers in stopping iron silicide formation is compared by SEM and TEM analysis of the substrate and resulting tubes. Alumina is shown to be the best barrier layer to grow high aspect ratio VACNTs.

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