Title: Vectorial crystal growth of oriented vertically aligned carbon nanotubes using statistical analysis

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Abstract: In this present work, crystalline growth conditions of oriented carbon nanotubes based on chemical vapor deposition (CVD) were optimized. The crystallinity and degree of alignment of the grown carbon nanotubes (CNTs) were characterized by field emission scanning electron microscopy, transmission electron microscopy, and Raman spectroscopy. The effects of four variables, namely, deposition time, deposition temperature, annealing process, and concentration of the precursor on the crystallinity of the CNTs, were explored. Furthermore, the correlation of parameters with the growth mechanism was examined using response surface methodology in an attempt to determine the complex interactions between the variables. A total of 30 runs, including predicting and consolidation runs to confirm the results, were required for screening the effect of the parameters on the growth of the CNTs. On the basis of the investigated model, it was found that the crystallinity of the CNTs grown by the CVD method can be controlled via restriction of the effective parameters. (Graph Presented).