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TITLE:
Optimization of growth conditions for the synthesis of vertically aligned arrays of single wall carbon nanotubes

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ABSTRACT BODY:
In this study we explored the possibility of growing vertically aligned arrays of single wall carbon nanotubes (VAA-SWNT) using evaporated metal catalyst films and a chemical vapor deposition (CVD) process. The evaporated catalyst films approach allows us to grow vertically aligned nanotubes in the patterned structures as required in different functional devices based on carbon nanotubes. Recently we have shown that for the Al/Fe/Mo catalyst system the number of walls in the VAA-MWNTs decreases when the growth temperature increases. For example, we were able to grow preferentially double wall carbon nanotubes with a fraction of SWNTs at $T \approx 700\ ^{o}C$ using C_2H_2 as feedstock gas. The goal of this study is to maximize the fraction of SWNTs in the vertically oriented arrays of nanotubes by optimizing the catalyst films, the growth conditions and the feedstock gas. Al/Co and Al/Mo/Co films deposited at different thicknesses and compositions were explored for this purpose, with ethanol vapor as the feedstock. To find the optimum growth temperatures for different catalyst films we used a time-resolved in-situ reflectivity technique which allowed us to perform rapid screening of the different catalyst films. The optimal growth conditions for vertically aligned arrays of SWNTs will be presented and discussed.
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