# Growth of Carbon Nanotubes within Porous Alumina Nano-Hole with Defined Diameter and Location

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Carbon nanotube (CNT) is one of the most promising materials anticipated to impact future nanotechnology. While many efforts to fabrication CNTs with high-quality rope or bundle types have been successful [1], however, it is still a challenge to produce arrays of isolated CNTs with uniform diameters and periodic arrangement to meet device requirement, such as magnetic probe microscope.

In this study, we report a new method to form periodic and uniform CNTs by pyrolysis of acetylene on nickel layer directly using self-organized nanoholes of anodized aluminum oxide [2]. The synthesis of individual CNTs with controlled diameters at predefined locations has been achieved. Employing conventional chemical vapor deposition (CVD), isolated CNTs were grown out of nanoholes in porous alumina created by anodizing method.

This allows the precise placement of individual CNTs on substrates without lithorgraphical process. Forethemore, the diameter of each CNT adjusts to the porous alumina nanohole size, which makes it possible to control this important property separately for individual CNTs. This approach provides a strong possibility for the manufacture of nanotube-based devices in a scalable batch process. In particular, the integration of CNTs into conventional silicon-technology with potential application as interconnects, transistors, memory cells, and magnetic scanning microscope with arrayed nano-probes becomes possible.

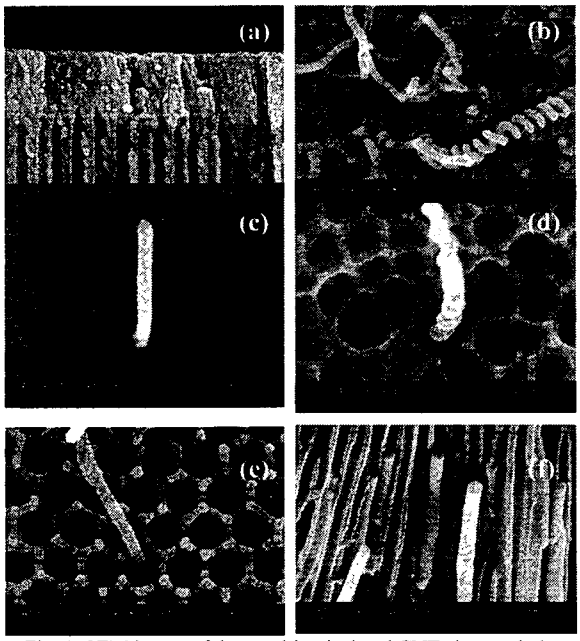


Fig. 1. SEM image of the resulting isolated CNTs in nanoholes. (A) Nickel layer by EB on porous alumina film. (b)~(e) CNTs growth from different diameters. (f) Cross section of porous alumina film; holes filled with individual CNTs.

## References

[1] J. Li, C. Papadopoulos and J. M. Xu, Appl. Phys. Lett., 75, 3 (1999).
[2] H. Masuda and K. Fukuda, Science, 268, 1466 (1995).