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Controlled growth of carbon nano-tube forest and graphene by chemical vapor deposition

Because of the excellent physical properties, carbon nano-tube (CNT) and graphene are highly expected as future functional devices in opto-electronics, nano-mechanics, etc. Here we demonstrate the controlled growth of vertically aligned CNTs (referred to as "CNT forest") and graphene. For the former growth, we used alcohol chemical vapor deposition (ACCVD) on SiO₂/Si substrates. We found that the structure of CNT forests varies with catalyst thickness, where the topmost surface is capped with graphite layers when the catalyst layers are enough thick. The difference in growth behavior between Fe and Co catalysts is also presented. The growth mechanism of CNT forests are in detail investigated using SEM and Raman spectroscopy. As for graphene growth, we successfully produce a large-size single domain around 2.5 mm in diameter by reduction in the number of nucleus and enhancement of carbon diffusion. The CVD growth is done on Cu substrates using methane as a source gas. High pressure annealing is found to be effective to make the Cu surface clean and flat with step-and-terrace structure. In addition, air introduction during the growth plays a role in enhancement of diffusion of active carbons.

Biography

Masamichi Yoshimura is the Professor and group leader of Surface Science laboratory at Toyota Technological Institute Nagoya Japan. He is the fellow of Surface Science Society of Japan. He has done pioneering research in the field of scanning probe microscopy high tech carbon materials. He has published over 200 papers in the international journals and delivered numerous invited and keynote lectures. He has BS, MS and PhD in Applied Physics and all from University of Tokyo Japan. He was a visiting scientist at Lawrence Berkeley National Laboratory.

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