

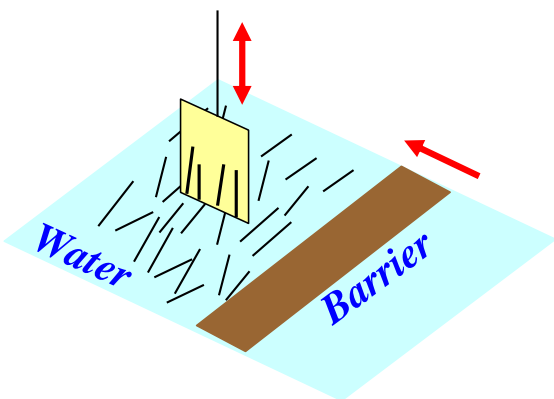
Carbon Nanotubes Made into High-Quality Thin Films!!

Purpose

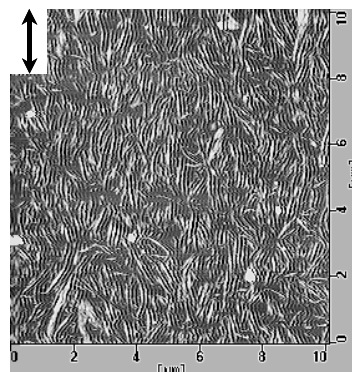
Realization of high-quality thin films of carbon nanotubes is of paramount importance for various industrial applications. Nanotechnology Research Institute, AIST is developing techniques to fabricate such thin films of single-wall carbon nanotubes (SWNTs), aiming to contribute to better understanding of their optoelectronic properties as well as to develop their novel applications.

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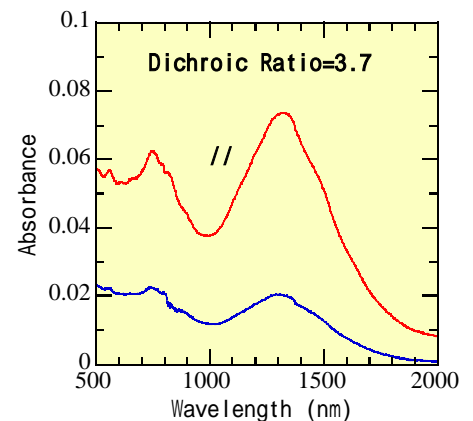
A technique called the Langmuir-Blodgett (LB) method is used for the thin film fabrication. SWNTs solubilized by chemical treatment is dissolved in chloroform and spread on the water surface, forming a SWNT thin layer on it. A glass substrate is dipped into the water and moved up and down with the thin layer transferred to the substrate surface in a layer-by-layer fashion, allowing to precisely control the film thickness. Thin films thus formed are optically homogeneous and the tubes are found to be aligned in parallel to the dipping direction. This is the world premier of SWNT films possessing such remarkable features. We aim to forward this line of research to develop novel applications of SWNTs.



Up-and-down stroke of the substrate while compressing with the barrier results in the formation of an LB film



AFM image of an LB film: Tubes are aligned in the dipping direction (arrow).



Dichroism of an LB film: Absorbance is much higher for light polarized parallel (//) to the dipping direction than perpendicular (⊥).

Publication

Y. Kim, N. Minami, W. Zhu, S. Kazaoui, R. Azumi, M. Matsumoto, *Japanese Journal of Applied Physics* Part 1, 42(12), 7629 (2003).