Research Title: Imaging Performance Improvement of Used-Atomic Force Microscopy
Researcher: Mr. Sirapat Pratontep, Miss Winadda Wongwiriyapan
Faculty: College of Nanotechnology

ABSTRACT

Modification of used atomic force microscope (AFM) cantilever by carbon nanotube (CNT) attachment and its imaging performance was demonstrated. CNT were directly grown on the apex of used Si AFM cantilevers by Ni catalyst-assisted chemical vapor deposition (CVD) using ethanol as the carbon source. The Ni catalyst film was deposited on the pyramid shape of the cantilever by the electroplating method. To obtain CNT protruding from the apex, the electroplating was performed at the optimal condition with Ni plating solution temperature of 40°C for 6 s at the applied voltage of 1.4 V, current of 0.01 A and the distance between anode and cathode of 13 cm. The CVD was operated at the optimal growth temperature of 850°C for 20 min. The field-emission electron microscope, the transmission electron microscope and the Raman spectrometer were utilized for the characterization of the synthesized CNT. There were 1-2 of thin tubular structures protruding from the apex of cantilever with the length of approximately 465 nm and the diameter of approximately 17.29 nm. The synthesized CNT were multi-walled carbon nanotube structure. For the imaging performance test, the AFM standard sample of micro-patterned Pt films on silicon dioxide was used as a test sample. Superior to new and used AFM cantilevers, the CNT-modified AFM cantilevers exhibit high-resolution imaging in both lateral and vertical resolution.

Keywords : atomic force microscopy, carbon nanotube, electroplating, chemical vapor deposition, image scanning, tip