

Controlling the CNT diameters by using Fe ion implanted wafers

이철훈, 이재근¹, 이건홍[†]
POSTECH; ¹KIST
(ce20047@postech.ac.kr[†])

CNT forest is a collection of aligned CNTs. CNT forest is typically grown from a catalyst-coated substrate. As a catalyst, Fe thin layer is deposited, which forms tiny particles at high temperature. When using Fe-deposited substrates, non-uniform sized Fe particles are formed because of the agglomeration from Fe migration and Ostwald ripening at high temperature. The agglomeration results in CNT forests that have broad CNT diameter distribution. Here, to overcome the non-uniform CNT diameters, we propose a method to grow CNT forest using Fe ion implanted substrate. Silicon wafers were implanted by Fe ions at $10^{16}/\text{cm}^2$ dose with 20 keV accelerating voltage. Each substrate was annealed for 15 min, 1 h, 4 h and 12 h at 800 °C to expose the Fe catalyst particles on the surfaces. According to the SIMS and AFM analysis, they confirm that the Fe particles were diffused out to the wafer surface and maintain their uniform sizes after 12 h of annealing at 800 °C. After the CNT growth, TEM images show that CNTs sizes are uniform, suggesting the possibility of maintaining the CNTs sizes. Using these Fe-implanted substrates, uniform-sized CNTs could be grown from the uniformly size-controlled Fe particles.