

【N-08】

Growth characteristics of Carbon nanotubes as NH₃ plasma treatment of different thickness of Ni catalyst

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It has been believed that the vertically aligned carbon nanotubes (CNTs) with small diameter, hence having large electric field enhancement factor, are the most ideally suited emitters for electron emission. However, the emission characteristics do not depend on their aspect ratio entirely. Some aligned CNTs with a high density and aspect ratio even exhibited poorer field emission (FE) properties than those of randomly distributed CNTs due to the field screening effect. Therefore the ability to control the location, orientation, and dimension of the nanotubes is essential for their applications in micro electrics. There have been many attempts to control the density of CNTs such as a patterned growth using lithography technique and anodic aluminum oxide (AAO) template. In this study, since CNTs can directly be grown on the catalyst particle by CVD and NH₃ pre-treatment affects the morphology of the catalyst layer, we controlled the density of CNTs using NH₃ pre-treatment of different thickness of Ni catalyst layer. We observed a change in the size and distribution of Ni nanoparticle at given NH₃ pre-treatment condition and catalyst thickness, and found a variation of the density of CNTs grown on the Ni nanoparticle.