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Effects of nitrogen introduced carbon nanotubes by using microwave plasma enhanced chemical vapor deposition.

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We have studied on the effects of nitrogen on the structure of carbon nanotubes (CNTs) synthesized by using microwave plasma enhanced chemical vapor deposition (MPECVD). CNTs were grown on the Ni/TiN/Si substrate at 650°C for 10min, 5min the precursor was H₂ and CH₄ of 8 : 1 , respectively. The amount of introduced N₂ was 10-90sccm under the above mentioned condition. The pressure and the applied microwave power were 20 Torr and 1000 and 400 w. We investigated the structure and crystallinity of nitrogen introduced CNTs in comparison with those of carbon nanotubes by scanning electron microscopy, transmission electron microscopy and Raman spectroscopy. Moreover, we measured the field emission current of CNTs with nitrogen and CNTs without nitrogen. With nitrogen, the growth rate of nanotubes decreased and crystallinity of nanotubes is improved. Nitrogen introduced CNTs have a bamboo structure with straightening morphology.