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Electron Transport of CN Nanowire Synthesized by PECVD

양지훈[1], 정재인[1], 염민형[2], 양철웅[2], 유지범[2], 박종윤[2]

[1]포항산업과학연구원, [2]성균관대학교, 나노튜브 및 나노복합구조 연구센터

The electron transport property of carbon nitride (CN) nanowire grown by plasma enhanced chemical vapor deposition was investigated by a transmission electron microscopy equipped with a tip of scanning electron microscopy. CN nanowires were grown on a 100 nm thick Ni film which was used as a catalytic layer on the base TiN/Si(100) substrate. In order to enhance the adhesion of the catalytic layer, a layer of TiN at a thickness of 100 nm was deposited on the Si (100) substrate. The substrate was loaded into the chamber which was evacuated to a pressure of 1×10^{-3} Torr. A gas mixture of C_2H_2 (10 sccm), NH_3 (40 sccm), and N_2 (60 sccm) was used as precursor. The working pressure was 5 Torr. The substrate was heated to 650°C using an IR lamp and the temperature was monitored using a thermocouple. The growth of the CN nanowire was carried out for 15 min. The structure of CN nanowire was nanobell or bamboo like, which have a compartment in the wall, so that a poor electron transport was predicted because the compartment acts as a scattering center for the electron transport. The capability of electron transport for the CN nanowire was about 8×10^{8} A/cm^2. Also, the conductivity of the CN nanowire was about $8G_0$ which was 4 times greater than the value of the theoretical calculation for single wall carbon nanotubes. In this report, we have claimed that each wall of CN nanowire contributed the transport of electrons.