Electrochemical Storage Hydrogen Of The Copper-decorated Carbon Nanotubes

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The inert surface of multi-walled carbon nanotubes was activated by a single-step mixed acid oxidized activation approach. The activated nanotubes catalyze nano-copper deposition specifically onto their surfaces upon immersion in electroless plating baths by a titration method. The extent of metal decoration was found to be dependent on the rate of the titration solution. The titration approach has previously not been applied to carbon nanotube substrates. Electroless plating of such tubes readily results in nanotubes fully coated with copper. The nature of the activated and decorated nanotubes was studied using infrared spectroscopy and transmission electron microscopy (TEM), respectively. A high electrochemical capacity of 1640 mAh/g of the nanocopper-decorated multi-walled carbon nanotubes (MWNTs) is obtained at a current density of 1500 mA/g in 6 M KOH aqueous solution. The electrochemical behavior of hydrogen storage in the MWNTs was also investigated using charge-discharge test and cyclic life. This suggests that the nanocopper-decorated multi-walled carbon nanotubes are a promising material for hydrogen storage.

Fig. 1 shows the specific hydroxyl (-OH) and carbonyl (=C=O) groups of the mixed acid oxidized activation. These radical groups on nanotubes would also show high catalytic activities.

Fig.2 and Fig.3 show micrographs of copper-decorated nanotubes at higher and lower magnification obtained by the titration method in a copper plating bath.

Fig.3 shows charge-discharge capacity of the copper-decorated nanotubes electrode at 50 mA current. The capacity of 1600 mAh/g on the nanocopper-decorated nanotubes is obtained at a current density in 6 M KOH aqueous solution.

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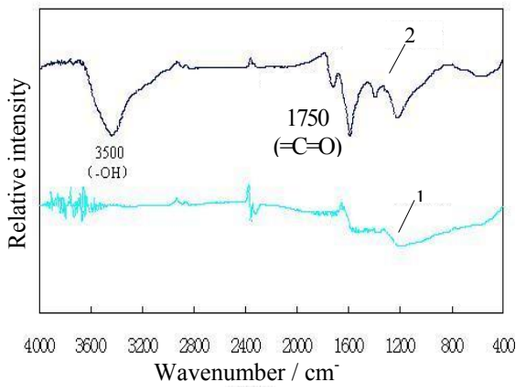

Fig.1 Infrared spectrum before (1)and after (2) nanotubes were activated by mixed acid.

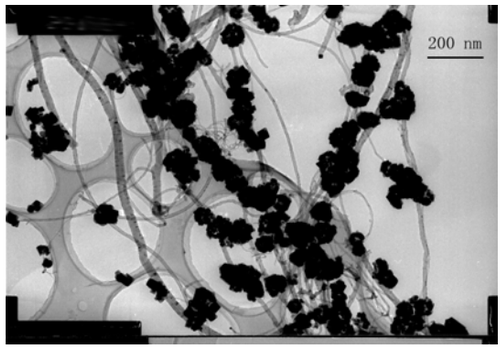

Fig. 2 TEM micrographs of copper-decorated nanotubes at higher magnification obtained by the titration method in a copper plating bath.

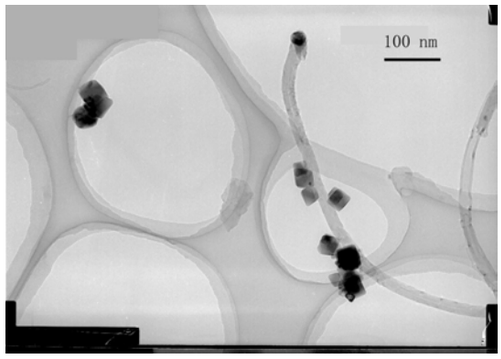

Fig. 3. TEM micrograph of the copper-coated nanotube at lower magnification. obtained by the titration method in a copper plating bath.

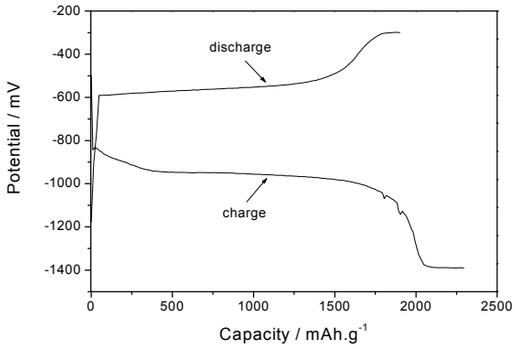

Fig.4 Charge-discharge capacity of the copper-decorated nanotubes electrode at 50 mA current