

density strongly depended on the crystallite size of the base iron substrate before growth.

[TANSO 2007 (No. 230) 304–9.]

doi:10.1016/j.carbon.2007.11.026

CVD synthesis of single-walled carbon nanotubes from CH₄ gas by using zeolite

Shinji Aoki^a, Toshiki Tsubota^a, Teruhisa Ohno^a, Tetsuro Manabe^b, Hirofumi Yajima^b

^aDepartment of Applied Chemistry, Faculty of Engineering, Kyushu Institute of Technology, 1–1 Sensui-cho, Tobata-ku, Kitakyushu, Fukuoka 804-8550, Japan

^bDepartment of Applied Chemistry, Faculty of Science, Tokyo University of Science, 1–3 Kagurazaka, Shinjuku-ku, Tokyo 162-8601, Japan

Single-walled carbon nanotubes (SWCNTs) need to be synthesized in large numbers at a low cost. We attempted to synthesize SWCNTs by a CVD process using CH₄ gas generated at a sewage treatment plant, as carbon source and zeolite as support material. When Fe/Co bimetal was used as the catalyst, the Raman spectrum of the sample which was produced at 750 °C indicated that the sample was high quality SWCNTs. In previous work SWCNTs were produced using alcohol as the source gas. However, if the yield is improved, this method will be interesting.

[TANSO 2007 (No. 230) 310–5.]

doi:10.1016/j.carbon.2007.11.027

The first-order Raman spectrum and graphitization of benzene-derived vapor-grown carbon fibers prepared by a seeding catalyst method

Akira Yoshida^a, Yutaka Kaburagi^a, Yoshihiro Hishiyama^b

^aFaculty of Engineering, Musashi Institute of Technology, 1-28-1 Tamazutsumi, Setagaya-ku, Tokyo 158-8557, Japan

^bProfessor Emeritus, Musashi Institute of Technology, 1-28-1 Tamazutsumi, Setagaya-ku, Tokyo 158-8557, Japan

The first-order Raman spectra for benzene-derived vapor-grown carbon fibers prepared with a seeding catalyst method and heat-treated at temperatures between 1800 and 3000 °C with a step of 200 °C for 30 min were studied as a function of interlayer spacing d_{002} . The d_{002} values were between 0.3359 and 0.3428 nm. The first-order Raman spectrum was measured by a Raman spectrometer equipped with a microscope system. The full width at half maximum intensity of the G band (G-FWHM) and the intensity of the D band relative to the G band (I_D/I_G) can be related well to d_{002} for the samples consisting of crystallites having a graphite structure. The values of G-FWHM for VGCF samples can be superimposed as a good fit to the previously obtained plots of G-FWHM against d_{002} for plane-oriented Kapton carbons having d_{002} values between 0.3356 and 0.3421 nm, except for plots of VGCFs with different average diameters heat-treated at 2600 °C. The plots for the

2600 °C-treated VGCFs could be associated with the polygonization observed with a scanning electron microscope for VGCFs heat-treated at temperatures above 2600 °C. Other spectroscopic parameters, Raman frequencies for the D, D' and G bands, FWHMs for the D and D' bands and the relative intensity of the D' band to the G band $I_{D'}/I_G$ are discussed with relation to d_{002} .

[TANSO 2007 (No. 230) 316–23.]

doi:10.1016/j.carbon.2007.11.028

Synthesis of carbon/limonite composites through CVD

Toshiki Tsubota^a, Shinji Aoki^a, Teruhisa Ohno^a, Tomoko Suenaga^b, Koichi Kuramoto^c, Tetsuro Manabe^d, Hirofumi Yajima^d

^aDepartment of Applied Chemistry, Faculty of Engineering, Kyushu Institute of Technology, 1-1 Sensuicho, Tobata-ku, Kitakyushu, Fukuoka 804-8550, Japan

^bDepartment of Materials Sciences, Kumamoto Industrial Research Institute, 3-11-38 Higashimachi, Kumamoto, Kumamoto 862-0901, Japan

^cJapan Limonite Co. Ltd., 16-11 Shimizukameicho, Kumamoto, Kumamoto 861-8066, Japan

^dDepartment of Applied Chemistry, Faculty of Science, Tokyo University of Science, 1-3 Kagurazaka, Shinjuku-ku, Tokyo 162-8601, Japan

Carbon/limonite composites were synthesized through chemical vapor deposition (CVD) of CH₄ with a help of a limonite catalyst. The limonite was heat-treated at 600 °C for 5 h in air before CVD in order to remove impurities. When the synthesis temperature was over 889 °C, carbon was deposited on the limonite. When the temperature was over 1025 °C, soot deposition was observed on the inner wall of the reaction tube. The amount of the deposits increased with increasing synthesis temperature and time. The obtained composite was attracted by a magnet.

[TANSO 2007 (No. 230) 324–8.]

doi:10.1016/j.carbon.2007.11.029

Electrical resistivity of sheet-type heaters with nanocarbon fillers

Tetsuya Isshiki^a, Yuki Ota^b, Masanori Tomita^b, Takashi Yanagisawa^b, Yoshiyuki Hattori^a, Fujio Okino^a

^aFaculty of Textile Science and Technology, Shinshu University, 3-15-1 Tokida, Ueda, Nagano 386-8567, Japan

^bGSI Creos Corporation, Nano Bio Development Center (NBDC), 1-12 Minami-Watarida, Kawasaki-ku, Kawasaki 210-0855, Japan

Sheet-type heaters were prepared using polyimide as a matrix with a mixture of two types of vapor-grown nanocarbon fillers, VGCFs and stacked-cup carbon nanotubes (SCNTs), and their electrical resistivity, thermal expansion and filler dispersion properties were evaluated. By using the heat resistant polymer, polyimide, it was expected that positive temperature coefficient (PTC) effects would appear at higher temperatures. The results