

Studying the influence of the concentration of alkaline solution to the formation of TiO₂ nanotube prepared by microwave-assisted hydrothermal method

Nguyen Huy Hao*, Sung Hun Cho and Soo W. Lee
 Research Center for Eco Multi-Functional Nano Materials, Sun Moon University, Korea
 *Corresponding author: swlee@sunmoon.ac.k

초 록: TiO₂ nanotubes (TNT) synthesized by microwave-assisted hydrothermal method by using TiO₂-P25 as a precursor at hydrothermal temperature 150°C in 4 hours. The concentration of alkaline solution is between 4M and 10M. Samples were characterized by X-ray diffraction (XRD), Raman spectroscopy (RS), Transmission electron microscopy (TEM), Brunauer-Emmett-Teller (BET) and UV-vis DRS spectroscopy. The results demonstrated the effects of the alkali concentration to the formation of nanotubes. The photocatalytic activity was investigated by degradation of Methylene Blue (MB).

1. 서론

In recent years, TiO₂ nanotubes (TNT) have been more attracting considerable attention due to their unique properties: Low cost, high surface area, ion exchange ability and high yield. There are different methods to prepare TNT such as the template method, anodic oxidation and the alkaline hydrothermal method. In this study, we used hydrothermal method because of high quality, high yield and easy to operate. In addition, by using microwave to support hydrothermal method, there is a significant reduction in hydrothermal time in comparison with traditional hydrothermal method.

2. 본론

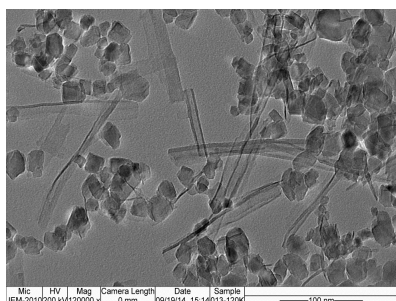


Fig. 1. Sample 1-using NaOH

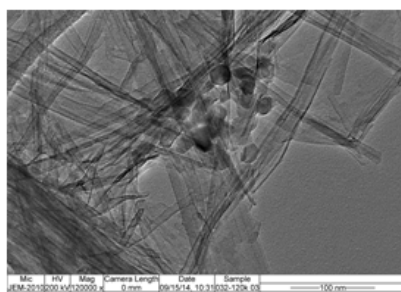


Fig. 2. Sample 2-using NaOH 6M

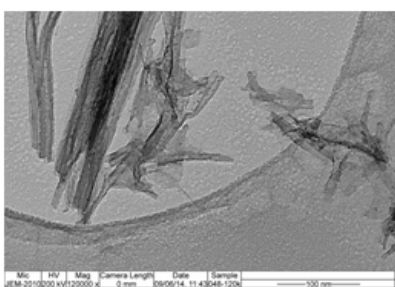


Fig. 3. Sample 3-using NaOH 8M

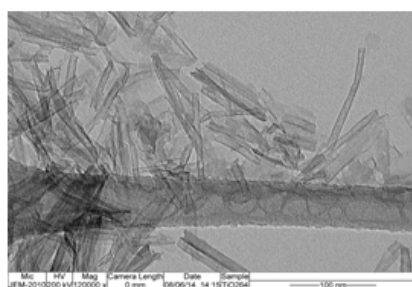


Fig. 4. Sample 4- using NaOH 10M

Table. 1. BET image for sample 1, 2, 3, 4

Sample	Sample 1 (NaOH 4M)	Sample 2 (NaOH 6M)	Sample 3 (NaOH 8M)	Sample 4 (NaOH 10M)
BET surface area (m ² /g)	110	210	231	219

TEM image showed when using NaOH 4M and 6M, products are mixture of TiO₂ particle and TiO₂ nanotube. However, with NaOH 8M and 10M, TiO₂ products only have nanotubes. These results are consistent with BET surface area. Surface area of Sample 2 (NaOH 6M), Sample 3 (NaOH 8M) and Sample 4 (NaOH 10M) is higher than Sample 1 (NaOH 4M) due to an increase of amount of formed nanotube.

3. 결론

The effect of the alkali concentration to the formation and properties of nanotubes was investigated. NaOH 8M and 10M is good for preparing TiO₂ nanotube.

참고문헌

1. Chung-Kung Lee, Cheng-Cai Wang, Meng-Du Lyu, *J. Colloid Interface Sci* 316 (2007) 562
2. Sung Hun Cho a, Gobinda Gyawali, *Mater. Chem. Phys* 145 (2014) 297
3. Chung Leng Wong, Yong Nian Tan, Abdul Rahman Mohamed, *J. Environ. Man* 92 (2011) 1669
4. Nan Liu, Xiaoyin Che, Jinli Zhang, *Catal.* 225 (2014) 34