



## REFERENCES

- Asahi, R., Morikawa, T., Ohwaki, T., Aoki, K. and Taga, Y. (2001) Science, 293 (5528), 269-271.
- Begum, N.S., Ahmed, H.M.F. and Gunashekar, K.R. (2008) Bulletin of Materials Science, 31 (5), 747-751.
- Choi, W., Termin, A. and Hoffmann, M.R. (1994) Journal of Physical Chemistry, 98, 13669-13679.
- Cosmo-Dec "Air Pollution Control" 30 April 2011 <[http://www.cosmodec.co.za/air\\_pollution\\_control.htm](http://www.cosmodec.co.za/air_pollution_control.htm)>
- Deng, L., Wang, S., Liu, D., Zhu, B., Huang, W., Wu, S. and Zhang, S. (2009) Catalysis Letter, 129, 513-518.
- Fan, X., Chen, X., Zhu, S., Li, Z., Yu, T., Ye, J. and Zou, Z. (2008) Journal of Molecular Catalysis A: Chemical, 284, 155-160.
- Fujishima, A. and Honda, K. (1972) Nature, 238, 37-38.
- Gong, D., Grimes, C.A., Varghese, O.K., Hu, W., Singh, R.S., Chen, Z. and Dickey, E.C. (2001) Journal of Materials Research, 16, 3331-3334.
- Hoffmann, M.R., Martin, S.T., Choi, W. and Bahnemann, D.W. (1995) Chemical Reviews, 95 (1), 69-96.
- Hoyer, P. (1996) Langmuir, 12, 1411-1413.
- Hsieh, C.T., Fan, W.S., Chen, W.Y. and Lin, J.Y. (2009) Separation and Purification Technology, 67 (3), 312-318.
- Hussain, S.T. and Siddiq, A. (2011) Journal of Environmental Science and Technology, 8 (2), 351-362.
- Jaimy, K.B., Ghosh, S., Sankar, S. and Warriar, K.G.K. (2011) Materials Research Bulletin, 46 (6), 914-921.
- Kasuga, T., Hiramatsu, M., Hoson, A., Sekino, T. and Niihara, K. (1998) Langmuir, 14, 3160-3163.
- Kasuga, T., Hiramatsu, M., Hoson, A., Sekino, T. and Niihara, K. (1999) Advanced Materials, 11, 1307-1311.
- Khan, M.A., Han, D.H. and Yang, O.B. (2009) Applied Surface Science, 255 (6), 3687-3690.

- Kim, D.H., Jang, J.S., Goo, N.H., Kwon, M.S., Lee, J.W., Choi, S.H., Shin, D.W., Kim, S.J. and Lee, K.S. (2009) Catalysis Today, 146 (1-2), 230–233.
- Kraetler, B. and Bard, A.J. (1977) Journal of the American Chemical Society, 99, 7729–7734.
- Lam, S.M., Sin, J.C. and Mohamed, A.R. (2008) Recent Patents on Chemical Engineering, 1 (3), 209–219.
- Li, J., Xu, J., Dai, W.L., Li, H. and Fan, K. (2009) Applied Catalysis B: Environmental, 85 (3), 162-170.
- Liu, F.K., Huang, P.W., Chang, Y.C., Ko, C.J., Ko, F.H. and Chu, T.C. (2005) Journal of Crystal Growth, 273 (3-4), 439-445.
- Li, Y., Li, X., Li, J. and Yin, J. (2006) Water Research, 40 (6), 1119-1126.
- Mor, G.K., Varghese, O.K., Paulose, M., Shankar, K. and Grimes, C.A. (2006) Solar Energy Materials and Solar Cells, 90, 2011–2075.
- Nie, X., Zhuo, S., Maeng, G. and Sohlberg, K. (2009) International Journal of Photoenergy, 2009, 22.
- Peng, Y.H., Huang, G.F. and Huang, W.Q. (2012) Advanced Power Technology, 23, 8-12.
- Poudel, B., Wang, W.Z., Dames, C., Huang, J.Y., Kunwar, S., Wang, D.Z., Banerjee, D., Chen, G. and Ren, Z.F. (2005) Nanotechnology, 16 (9) 1935–1940.
- Rashed, M.N. and El-Amin, A.A. (2007) International Journal of Physical Sciences, 2 (3), 73-81.
- San, N., Hatipoglu, A., Kocturk, G., Cinar, Z., Journal of Photochemistry and Photobiology A: Chemistry, 146 (2002), 189-197.
- Sekino, T. (2010) Applied Physics, 117, 17-23.
- Tu, Y.F., Huang, S.Y., Sang, J.P. and Zou, X.W. (2010) Materials Research Bulletin, 45 (2), 224-229.
- Vu, A.T., Nguyen, Q.T., Bui, T.H.L., Tran, M.C., Dang, T.P. and Tran, T.K.H. (2010) Advances in Natural Sciences: Nanoscience And Nanotechnology, 1,015009.
- Wang, Z., Cai, W., Hong, X., Zhao, X., Xu F. and Cai, C. (2005) Applied Catalysis B: Environmental, 57 (3), 223–231.

- Wei, G., Qin, W., Han, W., Yang, W., Gao, F., Jing, G., Kim, R., Zhang, D., Zheng, K., Wang, L. and Liu, L. (2009) Journal of Physical Chemistry C, 113, 19432.
- Wong, R.S.K., Feng, J., Hu, X. and Yue, P.L. (2004) Journal of Environmental Science and Health, 39 (10), 2583–2595.
- Wongtaewan C. (2011). Preparation of Titanium Oxide Nanotube by Microwave Irradiation Method. M.S. Thesis, The Petroleum and Petrochemical College.
- Xu, J.C., Lu, M., Guo, X.Y. and Li, H.L. (2005) Journal of Molecular Catalysis A: Chemical, 226, 123–127.
- Yang Y.Z. “TiO<sub>2</sub> Nanoparticles for Photocatalytic Applications” 30 April 2011 <<http://yangyang.blog.usf.edu/>>
- Yu, J., Yu, H., Cheng, B., Zhao, X. and Zhang, Q. (2006) Journal of Photochemistry and Photobiology A: Chemistry, 182, 121-127.
- Zhang, S., Chen, Y., Yu, Y., Wu, H., Wang, S., Zhu, B., Huang, W. and Wu, S. (2008) Journal of Nanopartical Research, 10 (5), 871–875.
- Zhu, J., Deng, Z., Chen, F., Zhang, J., Chen, H., Anpo, M., Huang, J. and Zhang, L. (2006) Applied Catalysis B: Environmental, 62, 329-335.
- Zwilling, V., Ceretti, E.D., Forveille A.B., David, D., Perrin, M.Y. and Aucouturier, M. (1999) Surface and Interface Analysis, 27 (7), 629–637.

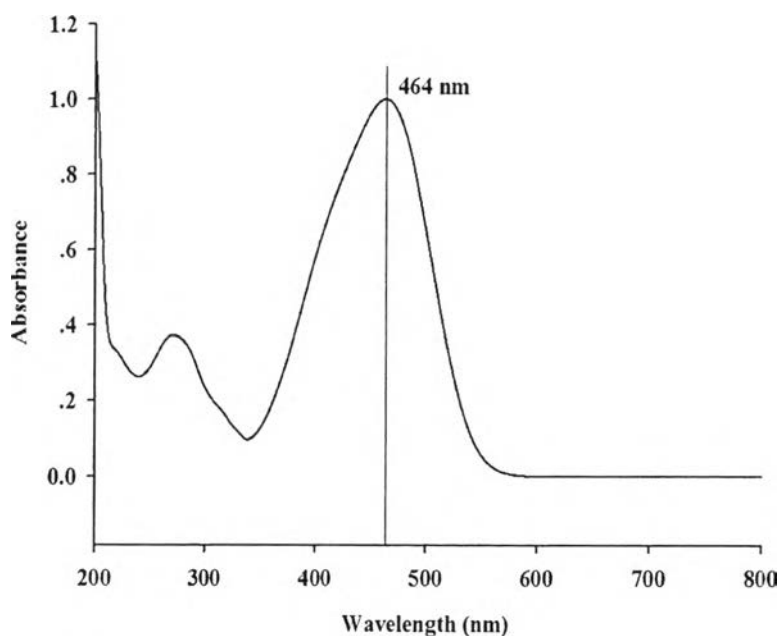
## APPENDIX

### Appendix A UV-Visible Spectrometer

Methyl orange concentration was identified by measuring light absorption of sampling solution. The absorption spectrum of methyl orange was taken to find a suitable wavelength to determine the methyl orange content. From Figure A, the 464 nm wavelength was selected to study. Concentration of the methyl orange was determined using the standard calibration curve and the equation shown below.

$$y = -0.0017 + 0.0489x$$

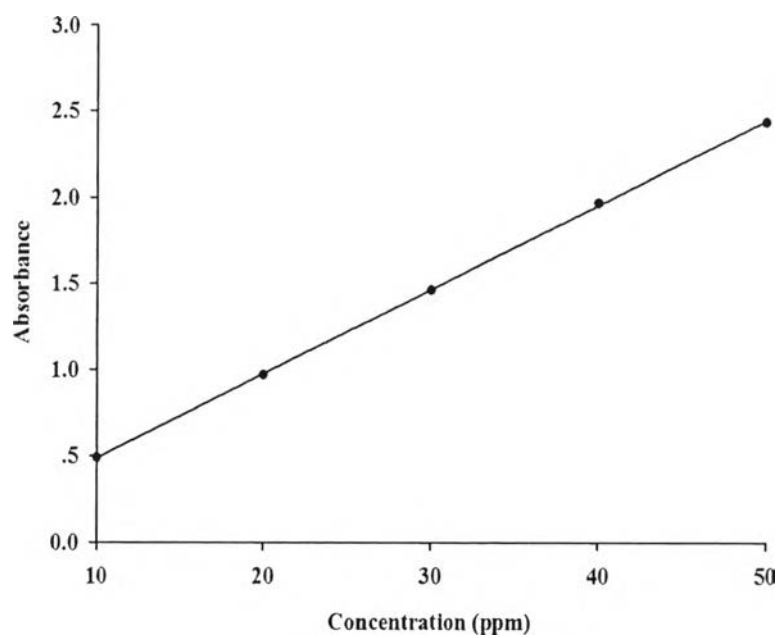
y = absorbance, x = methyl orange concentration



**Figure A1** UV-visible absorption spectrum (200-800) of methyl orange solution.

**Table A1** Absorbance and concentration of standard methyl orange solution

Concentration (ppm)	Absorbance
10	0.48912
20	0.96872
30	1.46216
40	1.96609
50	2.43301

**Figure A2** Calibration curve of methyl orange at various concentrations.

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**Proceedings:**

1. Piwnuan, C.; Chaisuwan, T.; Luengnaruemitchai, A.; and Wongkasemjit, S. (2012, April 24) Catalytic Activity of Metal Loaded Titania Nanotubes. Proceedings of the 3<sup>rd</sup> Research Symposium on Petrochemical and Materials Technology and the 18<sup>th</sup> PPC Symposium on Petroleum, Petrochemicals, and Polymers, Ballroom, Queen Sirikit National Convention Center, Bangkok, Thailand.

**Presentations:**

1. Piwnuan, C.; Chaisuwan, T.; Luengnaruemitchai, A.; and Wongkasemjit, S. (2012, March 25-29) Catalytic Activity of Metal Loaded Titania Nanotubes. Paper presented at the 243<sup>rd</sup> ACS National Meeting & Exposition, San Diego, CA, USA.
2. Piwnuan, C.; Chaisuwan, T.; Luengnaruemitchai, A.; and Wongkasemjit, S. (2012, April 24) Catalytic Activity of Metal Loaded Titania Nanotubes. Paper presented at the 3<sup>rd</sup> Research Symposium on Petrochemical and Materials Technology and the 18<sup>th</sup> PPC Symposium on Petroleum, Petrochemicals, and Polymers, Bangkok, Thailand.

