## REFERENCES

- "Air dye environment profile." *Air dye*. <www. airdye.com/about/how>.
- Amar, A.H. (2007). Development of a Simple Dip Coating Method for Immobilization of TiO<sub>2</sub> onto Solid Supports Using Direct TiO<sub>2</sub> Powder.
   M.S. Thesis, School of Chemistry, School of Biology and Institute of Postgraduate Studies, Universiti Sains Malaysia.
- Carp, O., Huisman, C.L., and Reller, A. (2004). Photoinduced reactivity of titanium dioxide. Progress in Solid State Chemistry, 32, 33-177.
- Chun, D.M., Kim, M.H., Lee, J.C., and Ahn, S.H. (2008). TiO<sub>2</sub> coating on metal and polymer substrates by nano-particle deposition system (NPDS). <u>CIRP</u>
  Annals Manufacturing Technology, 57, 551–554.
- Cullity, B.D. (1978). <u>Elements of X-ray diffraction</u>. Reading, MA: Addison-Wesley Plubication Company.
- Deng, X., Yue, Y., and Gao, Z. (2002). Gas phase photo-oxidation of organic compounds over nanosized TiO<sub>2</sub> photocatalysts by various preparations.

  <u>Applied Catalysis B: Environmental</u>, 39, 135-147.
- Ding, X., and Liu, X. (1998). Correlation between anatase-to-rutile transformation and grain growth in nanocrystalline titania. <u>Journal of Materials Research</u>, 13, 2556-2559.
- Fuerte, A., Hernandez-Alonso, M.D., Maire, A.J., Martinez-Arias, A., Fernadez-Garcia, M., Conesa, J.C., and Munuera, G. (2002). Nonosize Ti-W mixed oxides: effect of doping level in the photocatalystic degradation of toluene using sunlight-type excitation. <u>Journal of Catalysis</u>, 212, 1-9.
- Hoffmann, M.R., Martin, S.T., Choi, W., and Bahnemann, D.W. (1995). Environmental applications of semiconductor photocatalysis. <u>Chemical Reviews</u>, 95, 69-96.
- Ioannis, K., Konstantinou., and Triantafyllos, A., Albanis. (2003). TiO<sub>2</sub>-assisted photocatalytic degradation of azo dyes in aqueous solution: kinetic and mechanistic investigations A review. <u>Applied Catalysis B: Environmental</u>, 49, 1-14.

- Ishizaki, K., Komarneni, S., and Nanko, M. (1988). <u>Porous Materials Process</u>

  <u>Technology and Applications</u>, Kluwer Academic Publisher, London.
- Kajitvichyanukul, P. (2005) Coating of nanothinfilm on materials for environmental abatement.
  - <a href="mailto:</a>//www.stkc.go.th/stportalDocument/stportal\_1118026434.pdf">
- Kamat, P.V. (1995). Tailoring Nanostructured Thin Films, Chemtech.
- Konstantinou, K.I., and Albanis, A.T. (2004). TiO<sub>2</sub>-assisted photocatalytic degradation of azo dyes in aqueous solution: kinetic and mechanistic investigations. Applied Catalysis B: Environmental, 49, 1–14.
- Lachheb, H., Puzenat, E., Houas, A., Ksibi, M., Elaloui, E., Guillard, C., and Herrmann, J.M. (2002). Photocatalytic degradation of various types of dyes (Alizarin S, Crocein Orange G, Methyl Red, Congo Red, Methylene Blue) in water by UV-irradiated titania. <u>Applied Catalysis B: Environmental</u>, 39, 75–90.
- Lee, B.S., Mahajan, S., and Janda, K.D. (2005). Novel method for catalyst immobilization using an ionic polymer: a case study using recyclable ytterbium triflate. <u>Tetrahedron Letters</u>, 46, 807–810.
- Lim, C.K. (2004). <u>Electrophoretic Immobilization of TiO<sub>2</sub> Photocatalyst on Al, Cu, Cu/Ni and PET Plates for Photodegradation of Phenol.</u> Ph.D. Thesis, School of Chemical Sciences and Institute of Postgraduate Studies, USM.
- Lim, L.L.P., Lynch, R.J., and In, S.-I. (2009). Comparison of simple and economical photocatalyst immobilisation procedures. <u>Applied Catalysis A:</u>
  <u>General</u>, 365, 214–221.
- Liu, Y., Chen, X., Li, J., and Burda, C. (2005). Photocatalytic degradation of azo dyes by nitrogen-doped TiO<sub>2</sub> nanocatalysts. <u>Chemosphere</u>, 61, 11-18.
- Mary, H.G. (1991). <u>Encyclopedia of Chemical Technology</u>, Vol. 3, New York: A Wiley-Interscience Publication.
- Mills, A., Lee, S.K., and Lepre, A. (2003). Photodecomposition of ozone sensitised by a film of titanium dioxide on glass. <u>Journal of Photochemistry and Photobiology A: Chemistry</u>, 155, 199-205.

- Mugglie, D.S., and Ding, L. (2001). Photocatalytic performance of sulfated TiO<sub>2</sub> and Degussa P-25 TiO<sub>2</sub> during oxidation of organics. <u>Applied Catalysis B:</u> Environmental, 32, 181-188.
- Murakami, Y., Matsumoto, T., and Takasu, Y. (1999). Salt catalysts containing basic anions and acidic cations for the sol-gel process of titanium alkoxide: Controlling the kinetics and dimensionality of the resultant titanium oxide. Journal of Physical Chemistry B, 103, 1836-1840.
- Ollis, D.F., Pelizzetti, E., and Serpone, N. (1991). Destruction of water contaminants. Environmental Science and Technology, 25, 1523-1529.
- Park, S., Lee, J.H., Yoo, K., Park, H.J., Kim, H.S, and Lee, J.C. (2008) Adhesion properties of inorganic binders for the immobilization of photocatalytic ZnO and TiO<sub>2</sub> nanopowders. <u>Journal of Physics and Chemistry of Solids</u>, 69, 1461–1463.
- Puangpetch, T., Sreethawong, T., Yoshikawa, S., and Chavadej, S. (2008). Synthesis and photocatalytic activity in methyl orange degradation of mesoporous-assembled SrTiO<sub>3</sub> nanocrystals prepared by sol-gel method with the aid of structure-directing surfactant. <u>Journal of Molecular Catalysis</u> A: Chemical, 287, 70–79.
- Puma, G.L., Bono, A., Krishnaiah, D., and Collin, J.G. (2008). Preparation of titanium dioxide photocatalyst loaded onto activated carbon support using chemical vapor deposition: A review paper. <u>Journal of Hazardous</u> <u>Materials</u>, 157, 209–219.
- Rajeshwar, K. (1995). Photoelectrochemistry and the environment. <u>Journal of Applied Electrochemistry</u>, 25, 1067-1082.
- Rao, K.V.S., Subrahmanyam, M., and Boule, P. (2004) Immobilized TiO<sub>2</sub> photocatalyst during long-term use: decrease of its activity. <u>Applied Catalysis B: Environmental</u>, 49, 239–249.
- Robertson, P.K.J. (1996). Semiconductor photocatalysis: an environmentally acceptable alternative production technique and effluent treatment process. Journal of Cleaner Production, 4(3-4), 203-212.

- Rouquerol, F., Rouquerol, J., and Sing, K. (1999). <u>Adsorption by Powders and Porous Solid: Principle, Methodology and Applications</u>, Academic Press, San Diego.
- Savage, N., Chwieroth, B., Ginwalla, A., Patton, B.R., Akbar, S.A., and Dutta, P.K. (2001). Composite n-p semiconducting titanium oxides as gas sensors.

  <u>Sensors and Actuators B: Chemical</u>, 79, 17-27.
- Smith J.V., Editor. (1960). X-ray Powder Data File, American Society for Testing Materials
- Sreethawong, T., Suzuki, Y., and Yoshikawa, S. (2005) Synthesis, characterization, and photocatalytic activity for hydrogen evolution of nanocrystalline mesoporous titania prepared by surfactant-assisted templating sol-gel process. Journal of Solid State Chemistry, 178, 329-338.
- Sreethawong, T., and Yoshikawa, S. (2006). Enhanced photocatalytic hydrogen evolution over Pt supported on mesoporous TiO<sub>2</sub> prepared by single-step sol-gel process with surfactant template. <u>International Journal of Hydrogen Energy</u>, 31, 786-796.
- Sreethawong, T., Junbua, C., and Chavadej, S. (2009). Photocatalytic H<sub>2</sub> production from water splitting under visible light irradiation using Eosin Y-sensitized mesoporous-assembled Pt/TiO<sub>2</sub> nanocrystal photocatalyst. <u>Journal of Power Sources</u>, In Press.
- Sriwong, C., Wongnawa S., and Patarapaiboolchai, O. (2008). Photocatalytic activity of rubber sheet impregnated with TiO<sub>2</sub> particles and its recyclability. <u>Catalysis Communications</u>, 9(2), 213-218.
- Wang, C.C., and Ying J. (1999). Sol-gel synthesis and hydrothermal processing of anatase and rutile titania nanocrystals. <u>Chemistry of Materials</u>, 11, 3113-3120.
- Wu, J.C., and Chen, C.H.. (2004). A visible-light response vanadium-doped titania nanocatalyst by sol-gel method. <u>Journal of Photochemistry and Photobiology A: Chemistry</u>, 163, 509-515.

- Yang, Y., Guo, Y., Hua, C., Wang, Y., and Wang, E. (2004). Preparation of surface modifications of mesoporous titania with monosubstituted Keggin units and their catalytic performance for organochlorine pesticide and dyes under UV irradiation. Applied Catalysis A: General, 273, 201-210.
- Yang, Y., Jun, L.X., Tao, C.J., and Yan, W.L. (2004). Effect of doping mode on the photocatalytic activities of Mo/TiO<sub>2</sub>. <u>Journal of Photochemistry and Photobiology A: Chemistry</u>, 163, 517-522.
- Yao, W.F., Xu, X.H., Wang, H., Zhou, T.J., Yang, N.X., Zhang, Y., Shang, X.S., and Huang, B.B. (2004). Photocatalytic property of perovskite bismuth titanate. Applied Catalysis B: Environmental, 52, 109-116.
- Zhang, H.Z., and Banfield, J.F. (2000). Understanding polymorphic phase transformation behavior during growth of nanocrystalline aggregates: Insights from TiO<sub>2</sub>. <u>Journal of Physical Chemistry B</u>, 104, 3481-3487.
- Zhang, M., An, T., Hu, X., Wang, C., Sheng, G., and Fu, J. (2004). Preparation and photocatalytic properties of a nanometer ZnO-SnO<sub>2</sub> coupled oxide. <u>Applied Catalysis A: General</u>, 260, 215–222.
- Zhang, Z., Wang, C.C., Zakaria, R., and Ying, J.Y. (1998). Role of particle size in nanocrystalline TiO<sub>2</sub>-based photocatalysts. <u>Journal of Physical Chemistry</u> <u>B</u>, 102, 10871-10878.

## **CURRICULUM VITAE**

Name: Ms. Pavita Kunwanlee

Date of Birth: May 12, 1987

Nationality: Thai

**University Education:** 

2005-2009 Bachelor Degree of Science, Department of Chemical Technology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand

Working Experience:

2008 Position: Student Internship

Company name: PTT Public Company Limited,

Thailand

**Proceeding:** 

Kunwanlee, P., Sreethawong, T., and Chavadej, S. (2011, April 26)
 Immobilization of Mesoporous-Assembled TiO<sub>2</sub> Nanocrystal Photocatalyst for Degradation of Azo Dye Contaminant in Wastewater. Proceedings of <u>The 2<sup>nd</sup> Research Symposium on Petroleum, Petrochemicals, and Advanced Materials and The 17<sup>th</sup> PPC Symposium on Petroleum, Petrochemicals, and Polymers, Bangkok, Thailand.

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