



## DAFTAR PUSTAKA

- Adam, F. and Chua, J., 2004, The Adsorption of Palmytic Acid on Rice Husk Ash Chemically Modified with Al(III) Ion Using The Sol Gel Technique, *J. Coll. Int. Sci.*, 280, 55–61.
- Agorku, Kuvarega, A.T., Mamba, B.B., Pandey, A.C. and Mishra, A.K., 2015, Enhanced Visible-Vight Photocatalyst Activity of Multi-Elements-Doped ZrO<sub>2</sub> for Degradation of Indigo Carmine, *J. Rare Earths*, 33, 498–506.
- Ahmed, W. and Iqbal, J., 2020, Co Doped ZrO<sub>2</sub> Nanoparticles: An Efficient Visible Light Triggered Photocatalyst with Enhanced Structural, Optical and Dielectric Characteristics, *Ceram. Int.*, 46, 25833–25844.
- Akpan, U. and Hameed, B., 2010, The Advancements in Sol-gel Method of Doped-TiO<sub>2</sub> Photocatalyst, *Appl. Catal. A: Gen.*, 375, 1–11.
- Alfianda, K.N., 2021, Pengaruh Variasi Konsentrasi NiSO<sub>4</sub>•6H<sub>2</sub>O dan Suhu Kalsinasi Pada Sintesis Ni-doped ZrO<sub>2</sub> Sebagai Model Fotokatalis Responsif Sinar Tampak, Yogyakarta: Universitas Gadjah Mada.
- Alfina, B.T., 2015, Sintesis TiO<sub>2</sub>-N/Zeolit untuk Degradasi Methylene Biru, *Jurnal Ilmu Kimia Universitas Brawijaya*, 1(1), 599–605.
- Alijani, M. and Ilkhechi, N., 2018, Effect of Ni Doping on the Structural and Optical Properties of TiO<sub>2</sub> Nanoparticles at Various Concentration and Temperature, *Silicon*, 10, 2569–2575.
- Allen, N.S., Mahdjoub, N., Vishnyakov, V., Kelly, P.J. and Kriek, R.J., 2018, The Effect of Crystalline Phase (Anatase, Brookite and Rutile) and Size on the Photocatalytic Activity of Calcined Polymorphic Titanium Dioxide (TiO<sub>2</sub>), *Polym. Degrad. Stab.*, 150, 31–36.
- Arisanti, Y., Supriyatna, Y., Masduki, N. and Soepriyanto, S., 2019, Effect of Calcination Temperature on the Characteristic of TiO<sub>2</sub> Synthesized from Ilmenite and its Applications for Photocatalysis, *IOP Conf. Ser: Mater.*, 478.
- Asahi, R., Morikawa, T., Irie, H. and Ohwaki, T., 2014, Nitrogen-doped Titanium Dioxide as Visible-light-sensitive Photocatalyst: Design, Developments, and Prospects, *Chem. Rev.*, 114, 9824–9852.
- Basahel, S., Ali, T., Mokhtar, M. and Narasimharo, K., 2015, Influence of Crystal Structure of Nanosized ZrO<sub>2</sub> on Photocatalytic Degradation of Methyl Orange, *Nanoscale Res. Lett.*, 10, 73.
- Chang, S. and Doong, R., 2006, Characterization of Zr-Doped TiO<sub>2</sub> Nanocrystals Prepared by a Nonhydrolytic Sol-Gel Method at High Temperatures, *J. Phys. Chem.*, 110, 20808–20814.
- Chen, Y. and Dionysiou, D., 2006, Effect of Calcination Temperature on the Photocatalytic Activity and Adhesion of TiO<sub>2</sub> Film Prepared by the P-25 Powder-Modified Sol-gel Method, *J. Mol. Catal. A Chem.*, 244, 73–82.
- Choi, J., Park, H. and Michael, R., 2010, Effects of single Metal-Ion Doping on the Visible-Light Photoreactivity of TiO<sub>2</sub>, *J. Phys. Chem.*, 114, 783–792.



- Daghrir, R., Drogui, P. and Robert, D., 2013, Modified TiO<sub>2</sub> for Environmental Photocatalytic Application: A Review, *Ind. Eng. Chem. Res*, 52, 3581–3599.
- Das, L., Barodia, S., Sengupta, S. and Basu, J., 2015, Aqueous Degradation Kinetics of Pharmaceutical Drug Diclofenac by Photocatalysis Using Nanostructural Titania-Zirconia Composite Catalyst, *Int. J. Environ. Sci. Technol*, 12, 317–326.
- Dhamayanti, Y., Wijaya, K. dan Tahir, I., 2005, Fotodegradasi Zat Warna Methyl Orange Menggunakan Fe<sub>2</sub>O<sub>3</sub>-Montmorillonit dan Sinar Ultraviolet. Yogyakarta, FMIPA: Universitas Gadjah Mada.
- Dutta, H., Nandy, A. and Pradhan, S., 2016, Microstructure and Optical Characterizations of Mechanosynthesized Nanocrystalline Semiconducting ZrTiO<sub>4</sub> Compound, *J. Phys. Chem. Solids*, 95, 56–64.
- Elahifard, M. and Ahmadvand, S.M.A., 2018, Effects of Ni-doping on the Photo-catalytic Activity of TiO<sub>2</sub> Anatase and Rutile: Simulation and Experiment, *Mater. Sci. Semicon. Process*, 84, 10–16.
- Fatimah, I., Sugiharto, E., Wijaya, K., Tahir, I. dan Kamalia., 2006, Titan Dioksida Terdispersi Pada Zeolit Alam (TiO<sub>2</sub>/Zeolit) dan Aplikasinya untuk Fotodegradasi Congo Red, *Indo. J. Chem*, 6(1), 38–42.
- Ganesh, I., Gupta, A.K. and Kumar, P.P., 2012, Preparation and Characterization of Ni-Doped TiO<sub>2</sub> Materials for Photocurrent and Photocatalytic Applications, *J. Sci. World*, 13–20.
- George, A., Solomon, S., Thomas, J. and John, A., 2012, Characterizations and Electrical Properties of ZrTiO<sub>4</sub> Ceramic, *Mater. Ress. Bull.*, 47, 3141–3147.
- Guerrero-araque, D., Ramírez-ortega, D., Acevedo-pena, P., Tzompantzi, F., Calderon, H.A. and Gomez, R., 2017, Interfacial Charge-transfer Process Across ZrO<sub>2</sub>-TiO<sub>2</sub> Heterojunction and its Impact on Photocatalytic Activity, *J. Photochem. Photobiol. A Chem*, 335, 276–286.
- Gumus, D. and Akbal, F., 2011, Photocatalytic Degradation of Textile Dye and Wastewater, Water, Air, Soil Pollutant, *Focus*, 216, 117–124.
- Gunlazuardi, J. dan Tjahjanto, R., 2011, Preparasi Lapisan Tipis TiO<sub>2</sub> sebagai Fotokatalis: Keterkaitan antara Ketebalan dan Aktivitas Fotokatalisis, *Jurnal Penelitian Universitas Indonesia*, 5, 81–91.
- Hamad, H., Bailón-garcía, E., Pérez-cadenas, A.F., Maldonado-hódar, F.J. and Carrasco-marín, F., 2020 ZrO<sub>2</sub>-TiO<sub>2</sub>/ Carbon core-shell Composites as Highly Efficient Solar-Driven Photo-Catalysts: An Approach for Removal of Hazardous Water Pollutants, *J. Environ. Chem. Eng*, 8, 104–350.
- Hamadanian, M., Reisi-Vanani, A., Behpour, M. and Esmaeily., 2011, Synthesis and Characterization of Fe,S-codoped TiO<sub>2</sub> Nanoparticles: Application in Degradation of Organic Water Pollutants, *Desalination*, 281, 319–324.
- Han, Y. and Zhu, J., 2013, Surface Science Studies on the Zirconia-Based Model Surface Science Studies on the Zirconia-Based Model Catalyst, *Top. Catal*, 56, 1525–1541.
- Hanaor, D. and Sorrell, C., 2011, Review of the Anatase to Rutile Phase Transformation, *J. Mater. Sci*, 855–874.
- Hidayat, W., 2008, Teknologi Pengolahan Air Limbah, Jakarta: Majari Magazine.



- Hinojosa, M., Camposeco, R., Ruiz, F., Rodríguez, V. and Moctezuma, E., 2019, Promotional Effect of Metal Doping on Nanostructured TiO<sub>2</sub> During the Photocatalytic Degradation of 4-chlorophenol and Naproxen sodium as Pollutants, *Mater. Sci. Semicond. Process*, 100, 130–139.
- Hoffman, M., Martin, S., Choi, W. and Bahnemann, D., 1995, Environmental Applications of Semiconductor Photocatalysis, *Chem. Rev*, 95, 69–96.
- Hu, S., Li, F., Fan, Z. and Chang, C., 2011, Enhanced Photocatalytic Activity and Stability of Nano-Scaled TiO<sub>2</sub> Co-Doped with N and Fe, *Appl. Surf. Sci*, 258, 182–188.
- Kakuma, Y., Nosaka, A. and Nosaka, Y., 2015, Difference in TiO<sub>2</sub> Photocatalytic Mechanism Between Rutile and Anatase Studied by Detections of Active Oxygen and Surface Species in Water, *Phys. Chem*, 1–8.
- Kansal, S., Singh, M. and Sud, D., 2006, Studies on Photodegradation of Two Commercial Dyes in Aqueous Phase Using Different Photocatalyst, *J. Hazard. Mater*, 175, 48–55.
- Kim, C.S., Shin, J.W., Cho, Y.H., Jang, H.D., Byun, H.S. and Kim, T.O., 2013, Synthesis and Characterization of Cu/N-doped Mesoporous TiO<sub>2</sub> Visible Light Photocatalysts, *App. Cat A: Gen*, 455, 211–218.
- Kubiak, A., Siwińska-Ciesielczyk, K. and Jesionowski, T., 2018, Titania-Based Hybrid Materials with ZnO, ZrO<sub>2</sub> and MoS<sub>2</sub>: A review, *Materials. Basel*, 11, 1–56.
- Kumar, D., Singh, A., Kaur, N., Thakur, A. and Kaur, R., 2020, Tailoring Structural and Optical Properties of ZrO<sub>2</sub> with Nickel Doping, *SN Appl. Sci*, 2.
- Kurniawan, R., Sudiono, S., Trisunaryanti, W., and Syoufian, A., 2019, Synthesis of Iron-Doped Zirconium Titanate as a Potential Visible-Light Responsive Photocatalyst, *Indones. J. Chem.*, 19, 454-460.
- Lestari, Y., Wardhani, S. dan Khunur, M., 2015, Degradasi Methylene Blue Menggunakan Fotokatalis TiO<sub>2</sub>-N/Zeolit dengan Sinar Matahari, *Jurnal Ilmu Kimia Universitas Brawijaya*, 1, 592.
- Li, Z., Liu, S., Du, M., Wang, J., Srivastava, G.P., Wang, M., Wei, T., Zou, Y., Xiao, N. and Zhou, Q., 2021, Study of Synthesis and Photocatalytic Performance of the Monoclinic/Cubis Heterophase Junction of Rare Earth Doped Zirconia, *J. Phys. Chem. Solids*, 159, 110286.
- Liu, G., Wang, L., Yang, H. and Lu, G., 2009, Titania Based Photocatalyst Crystal Growth, Doping, and Heterostructuring, *J. Mater. Chem*, 20, 831–843.
- Martínez-Castañón, G., Sánchez-Loredo, M., Martínez-Mendoza, J. and Ruiz, F., 2005, Synthesis of CdS Nanoparticles: A Simple Method in Aqueous Media, *J. Mater*, 1, 1–7.
- Mogal, S.I., Mishra, M., Gandhi, V.G., and Tayade, R.J., 2012, Metal Doped Titanium Dioxide: Synthesis and Effect of Metal Ions on Physico-Chemical and Photocatalytic Properties, *Mater. Sci. Forum*, 734, 364-378.
- Nakata, K. and Fujishima, A., 2012, TiO<sub>2</sub> Photocatalysis: Design and Applications, *J. Photochem. Photobiol. Photochem. Rev*, 13, 169–189.



- Rahimi, N., Pax, R.A., and Gray, E.M.A., 2016, Review of Functional Titanium Oxides (TiO<sub>2</sub>) and its Modifications, *Prog. Solid State Chem*, 44, 86–105.
- Rahmawati, L., Kurniawan, R., Prasetyo, N., Sudiono, S., and Syoufian, A., 2023, Copper-and-Nitrogen-Codoped Zirconium Titanate (Cu-N-ZrTiO<sub>4</sub>) as Photocatalyst for Photo-Degradation of Methylene Blue under Visible-Light Irradiation, *Indones. J. Chem*, 23(2), 416–424.
- Rani, A., Dhiman, R., Singh, V. and Kumar, S., 2021, Photocatalytic Study of Ni-N-Codoped TiO<sub>2</sub> Nanoparticles Under Visible Light Irradiation, *Nano Express*, 2(3).
- Reddy, C., Reddy, N., Reddy, K., Jaesool, S. and Yoo, K., 2018, Template-free Synthesis of Tetragonal Co-doped ZrO<sub>2</sub> Nanoparticles for Applications in Electrochemical Energy Storage and Water Treatment, *J. electacta*, 317, 416–426.
- Reddy, C. V., Shetti, N.P., Kim, D., Sim, J., Aminabhavi, T.M. and Ravindranadh, K., 2020, Copper-doped ZrO<sub>2</sub> Nanoparticles as High-Performance Catalysts for Efficient Removal of Toxic Organic Pollutants and Stable Solar Water Oxidation, *J. Environ. Manag*, 110088, 260.
- Sun, X., Dong, J. and Zhang, Y., 2010, Preparation of Nanocrystallin TiO<sub>2</sub> Photocatalyst of Ce/N-Codoped TiO<sub>2</sub>, Particles for Production of H<sub>2</sub> by Photocatalytic Spitting Water, Under Visible Light, *Catal*, 43, 87–90.
- Takashi, H., Sunagawa, Y., Myagmarjav, S., Yamamto, K., Sato, N., and Muramatsu, 2003, Reductive Deposition of Ni-Zn Nanopartikel Selectively on TiO<sub>2</sub> Fine Particles in the Liquid Phase, *Materials Transactions*, 11(44).
- Tian, G., Pan, K., Fu, H., Jing, L. and Zhou, W., 2009, Enhanced Photocatalytic Activity of S-doped TiO<sub>2</sub>-ZrO<sub>2</sub> Nanoparticles Under Visible-Light Irradiation, *J. Hazard. Mater*, 166, 939–944.
- Ullatil, S., Chen, H. and Periyat, P., 2017, Sol-Gel Synthesis of Titanium Dioxide in Sol-Gel Materials for Energy, *Environ. Electro. Appl.*, 271–283.
- Verma, S., Rani, S., Kumar, S., and Khan, M.A.M., 2018, Rietveld Refinement, Micro-Structural, Optical ana Thermal Parameters of Zirconium Titanate Composites, *Ceram. Int.*, 2(44), 1653–1661.
- Wan, H., Yao, W., Zhu, W., Tang, Y., Ge, H., Shi, X. and Duan, T., 2018, Fe-N Co-Doped SiO<sub>2</sub>-TiO<sub>2</sub> Yolk-Shell Hollow Nanospheres with Enhanced Visible Light Photocatalytic Degradation, *Appl. Surf. Sci*, 444, 355–363.
- Wang, H., Zhang, L., Chen, Z., Hu, J., Li, S. and Wang, Z., 2014, Semiconductor Heterojunction Photocatalysts: Design, Construction, and Photocatalytic Performances, *Chem. Soc. Rev*, 43, 5234–5244.
- Wardhani, S., Ramadhana, K. dan Purwanugroho., 2013, Fotodegradasi Zat Warna Jingga Metil Menggunakan TiO<sub>2</sub>-Zeolit dengan Penambahan Anion Anorganik NO<sub>3</sub>, *J. Chem. Stud.*, 1, 98–104.
- Weng, B., Qi, M.Y., Han, C., Tang, Z.R. and Xu, Y.J., 2019, Photocorrosion Inhibition of Semiconductor-Based Photocatalysts: Basic Principle, Current Development, and Future Perspective, *ACS Catal*, 9, 4642–4687.
- Widihati, I., Diantariani, N. dan Nikmah, Y., 2011, Fotodegradasi Metilen Biru dengan Sinar UV dan Katalis Al<sub>2</sub>O<sub>3</sub>, *J. Chem.*, 1(5), 31–42.



- Wijaya, K., Sugiharto, E., Fatimah, I., Sudiono, S. dan Kurniyasih, D., 2006, Utilisasi TiO<sub>2</sub>-Zeolit dan Sinar UV Untuk Fotodegradasi Zat Warna Congo Red, *Teknoin*, 11(3), 199–209.
- You, J., Guo, Y., Guo, R. and Liu, X., 2011, Photoelectrochemical and Photocatalytic Properties of N+S Co-Doped TiO<sub>2</sub> Nanotube Array Films Under Visible Light Irradiation, *J. Mater. Chem. Phys.*, 129, 553–557.
- Yuan, Y., Ruan, L., Barber, J., Loo, S.C.J. and Xue, C., 2014, Heteronanostructured Suspended Photocatalysts for Solar-to-Fuel Conversion, *Energy. Environ.*, (7), 3934–3951.
- Zaleska, A., 2008, Doped-TiO<sub>2</sub>: A Review', *Rec. Patents. Eng.*, 2, 157–164.