

REFERENCES

- Ahmad, A., Awan, H., Azis, S., 2007., Synthesis and Applications of TiO₂ Nanoparticles, In, *70th Annual Session Proceedings of Engineering Congress Pakistan*, 676, 405–412.
- Ahmad, K., Kakakhel, M., Hayat, S., Wazir, U.D., Mahmood, M.M., Rehman, S., Sikander, M., Siddique, M.T., 2021, Thermoluminescence study of pellets prepared using NaCl from Khewra Salt Mines in Pakistan, *Radiat. Environ. Biophys.*, 60, 365–375.
- Anggraeni, V.M.P., Supriyatna, Y.I., Astuti, W., Sumardi, S., 2023, Ilmenite Sand Direct Leaching Kinetics in Hydrochloric Acid Solution, *J. Sustain. Metall.*, 9(10), 1578–1588.
- Aristanti, Y., Supriyatna, Y.I., Masduki, N.P., Soepriyanto, S., 2019, Effect of calcination temperature on the characteristics of TiO₂ synthesized from ilmenite and its applications for photocatalysis, In, *IOP Conference Series: Materials Science and Engineering*, 478, January 2019, Jakarta Barat.
- Armakovic, S.J., Savanovic, M.M., Armakovic, S., 2023, Titanium dioxide as the Most Used Photocatalyst for Water Purification: An Overview, *Catalysts*, 13(1), 26.
- Batzill, M., 2011, Fundamental aspects of surface engineering of transition metal oxide photocatalysts, *Energy Environ. Sci.*, 4(9), 3275–3286.
- Biswas, R.K., Mondal, M.G.K., 1987, A study on the dissolution of ilmenite sand, *Hydrometallurgy*, 17(3), 385–390.
- Brady, G.S., 1971, *Materials Handbook*, McGraw-Hill, New York.
- Carlucci, C., Degennaro, L., Luisi, R., 2019, Titanium Dioxide as a Catalyst in Biodiesel Production, *Catalysts*, 9(1), 75.
- Chalastara, K., Guo, F., Elouatik, S., Demopoulos G.P., 2020, Tunable Composition Aqueous-Synthesized Mixed-Phase TiO₂ Nanocrystals for Photo-Assisted Water Decontamination: Comparison of Anatase, Brookite and Rutile Photocatalysts, *Catalysts*, 10(4), 407.
- Choi, H., Al-Abed, S.R., Dionysiou, D.D., Stathatos, E., Lianos, P., 2010, TiO₂-Based Advanced Oxidation Nanotechnologies for Water Purification and Reuse, In, *Sustainability Science and Engineering*, Elsevier Ltd., 2, 229–254.

- Dang, J., Zhang, G.-H., Chouo, K.-C., 2015, Kinetics and mechanism of hydrogen reduction of ilmenite powders, *J. Alloy. Compd.*, 619, 443–451.
- Di Paola, A., Bellardita, M., Palmisano, L., 2013, Brookite, the Least Known TiO₂ Photocatalyst, *Catalysts*, 3(1), 36–73.
- Diebold, U., 2003, The surface science of titanium dioxide, *Surf. Sci. Rep.*, 48(5–8), 53–229.
- Dubey, R.S., 2018, Temperature-dependent phase transformation of TiO₂ nanoparticles synthesized by sol-gel method, *Mater. Lett.*, 215, 312–317.
- Freyria, F.S, Blangetti, N., Esposito, S., Nasi, R., Armandi, M., Annelio, V Bonelli, B., 2020, Effects of the Brookite Phase on the Properties Different Nanostructured TiO₂ Phases Photocatalytically Active Towards the Degradation of N-Phenylurea. *ChemistryOpen*, 9(9), 903–912.
- Gázquez, M.J., Bolívar, J.P., Garcia-Tenorio, R., Vaca, F., 2014, A review of the production cycle of titanium dioxide pigment, *MSA*, 5(7), 441–458.
- Ginting, L.I.B., Manaf, A., Astuti, W., Supriyatna, Y.I., Bahfie, F., 2023, Study of Titanium Dioxide (TiO₂) Extraction Process from Ilmenite Banten, In, *IOP Conference Series: Earth and Environmental Science*, Institute of Physics.
- Guo, Y., Wang, C., Wang, S., Chen, F., Yang, L., Zheng, Y., 2023, Effect of Magnesium on the Mineral Phase Composition of Ilmenite in CO-CO₂ Atmosphere Under Various Conditions, *JOM.*, 76(12), 3321–3333.
- Gireesh, V.S., Vinod, V.P., Krishnan Nair, S., Ninan, G., Catalytic leaching of ilmenite using hydrochloric acid: A kinetic approach, *Int. J. Miner. Process*, 134, 36–40.
- Ismael, M., 2020, A review and recent advances in solar-to-hydrogen energy conversion based on photocatalytic water splitting over doped-TiO₂ nanoparticles, *Sol. Energy*, 211, 522–546.
- Jiang, X., Manawan, M., Feng, T., Qian, R., Zhao, T., Zhou, G., Kong, F., Wang, Q., Dai, S., Pan, J.H., 2018, Anatase and rutile in evonik aeroxide P25: Heterojunctioned or individual nanoparticles?, *Catal. Today*, 300, 12–17.
- Kovačič, Ž., Likozar, B., Huš, M., 2022, Electronic properties of rutile and anatase TiO₂ and their effect on CO₂ adsorption: A comparison of first principle approaches, *Fuel*, 328, 125322.

- Lalasari, L.H., Firdiyono, F., Yuwono, A.H., Harjanto, S., Suharno, B., 2012, Preparation, Decomposition and Characterizations of Bangka - Indonesia Ilmenite (FeTiO_3) Derived by Hydrothermal Method Using Concentrated NaOH Solution, *Adv. Mater. Res.*, 535–537, 750–756.
- Lan, Y., Lu, Y., Ren, Z., Mini review on photocatalysis of titanium dioxide nanoparticles and their solar applications, *Nano Energy*, 2013, 2(5), 1031–1045.
- Li, Q., Fung, K.Y., Ng, K.M., 2019, Hydrometallurgy process for the recovery of valuable metals from $\text{LiNi}_{0.8}\text{Co}_{0.15}\text{Al}_{0.05}\text{O}_2$ cathode materials, *SN Appl. Sci.*, 1(7), 690.
- Liang, B., Li, C., Zhang, C., Zhang, Y., 2005, Leaching kinetics of Panzhihua ilmenite in sulfuric acid, *Hydrometallurgy*, 76(3–4), 173–179.
- Lu, Z.-Y., Muir, D.M., 1988, Dissolution of metal ferrites and iron oxides by HCl under oxidising and reducing conditions, *Hydrometallurgy*, 21(1), 9–21.
- Mackey, T.S., 1974, Acid Leaching of Ilmenite into Synthetic Rutile, *Ind. Eng. Chem. Res.*, 13(1), 9–18.
- Mahmoud, M.H.H., Afifi, A.A.I., Ibrahim, I.A., 2004, Reductive leaching of ilmenite ore in hydrochloric acid for preparation of synthetic rutile, *Hydrometallurgy*, 73(1–2), 99–109.
- Mamaghani, A.H., Haghghat, F., Lee, C.-S., 2020, Role of Titanium Dioxide (TiO_2) Structural Design/Morphology in Photocatalytic Air Purification, *Appl. Catal. B.*, 269, 118735.
- Mathpal, M.C., Tripathi, A.K., Singh, M.K., Gairola, S.P., Pandey, S.N., Agarwal, A., 2013, Effect of annealing temperature on Raman spectra of TiO_2 nanoparticles, *Chem. Phys. Lett.*, 555, 182–186.
- Mohar, M.T., Fatmawati, D., Sasongko, S.B., 2013, Pembuatan Pigment Titanium Dioksida (TiO_2) Dari Ilmenite (FeTiO_3) Sisa Pengolahan Pasir Zircon Dengan Proses Becher, *J. Teknol. Kim. Ind.*, 2(4), 110–116.
- Najafi, A., 2017, A novel synthesis method of hierarchical mesoporous MgO nanoflakes employing carbon nanoparticles as the hard templates for photocatalytic degradation, *Ceram. Int.*, 43(7), 5813–5818.
- Ngon, H.T., Tuan, P.D., Kien, K.D. T., Khoa, T.A., Vi, T.K., Tuyet, V.N., 2025, Influence of NaOH Concentration on the Crystallization and Phase Development of Titanium Dioxide Derived from Titanium Slag via Hydrothermal Processing, *Indones. J. Chem.*, 25(2), 471–481.

- Post, J.E., Burnham, C.W., 1986, Ionic modeling of mineral structures and energies in the electron gas approximation: TiO₂ polymorphs, quartz, forsterite, diopside, *Am. Mineral.*, 71(1–2), 142–150.
- Razavi, R., Hosseini, S.M.A, Ranjbar, M., 2014, Production of Nanosized Synthetic Rutile from Ilmenite Concentrate by Sonochemical HCl and H₂SO₄ Leaching, *Iran. J. Chem. Chem. Eng.*, 33(2), 29–36.
- Rzaij, J.M., Abass, A.M., 2020, Review on: TiO₂ Thin Film as a Metal Oxide Gas Sensor, *J. Chem. Rev.*, 2(2), 114–121.
- Sampath, A.H.J., Wickramasinghe, N. D., de Silva, K. M. N., de Silva, R. M., 2023, Methods of Extracting TiO₂ and Other Related Compounds from Ilmenite, *Minerals*, 13(5), 662.
- Shang, J., Chai, M., Zhu, Y., 2003, Solid-Phase Photocatalytic Degradation of Polystyrene Plastic with TiO₂ as Photocatalyst, *J. Solid State Chem.*, 174(1), 104–110.
- Setyani, E., Rahman, T.P., Nugroho, D.W., Rahman, S., Irawan, F., Ikono, R., Rochman, N.T., Dwandaru, W.S.B., 2014, The Effect of Roasting Temperature at 400°C and Sulphuric Acid Concentration on TiO₂ Extraction Process from Zircon Sand Ilmenite, *Jurnal Fisika dan Aplikasinya*, 10(3), 109–112.
- Singh, R.S., Rangari, V.K., Sanagapalli, S., Jayaraman, V., Mahendra, S., Singh, V.P., 2004, Nano-Structured CdTe, CdS and TiO₂ for Thin Film Solar Cell Applications, *Sol. Energy Mater. Sol. Cells*, 82(1–2), 315–330.
- Subagja, R., 2016, Ekstraksi titanium dari ilmenit baja melalui tahap dekomposisi dengan KOH dan pelarutan dengan asam sulfat, In, *Prosiding Seminar Nasional Sains dan Teknologi Universitas Muhammadiyah Jakarta 2016*, November 8th 2016, Jakarta.
- Suhartono, B., 2001, Studi Preparasi Senyawa Titanium Dioksida dari Pasir Besi Cilacap dan Pembanding Pasir Besi Bangka Dengan Proses Pelarutan Asam Klorida, *Thesis*, FMIPA UI, Depok.
- Supriyatna Y.I., Sumardi, S., Astuti, W., Nainggolan, A.N., Ismail, A.W., Petrus, H.T.B.M., Prasetya, A., 2020, Characterization and A Preliminary Study of TiO₂ Synthesis from Lampung Iron Sand, *Key Eng. Mater.*, 849, 113–118.

- Tao, T., Chen, Q., Hu, H., Yin, Z., Chen, Y., 2012, TiO₂ nanoparticles prepared by hydrochloric acid leaching of mechanically activated and carbothermic reduced ilmenite, *Trans. Nonferrous Met. Soc. China*, 22(5), 1232–1238.
- Tran, H.T.T., Kosslick, H., Ibad, M.F., Fischer, C., Bentrup, U., Vuong, T.H., Nguyen, L.Q., Schulz, A., 2017 Photocatalytic Performance of Highly Active Brookite in the Degradation of Hazardous Organic Compounds Compared to Anatase and Rutile. *Appl. Catal. B Environ.*, 200, 647–658.
- Walpole, E.A., Winter, J.D., 2002, The Austpac ERMS and EARS Processes for the Manufacture of High-Grade Synthetic Rutile by the Hydrochloric Acid Leaching of Ilmenite, In, *International Conference on the Practice and Theory of Chloride/Metal Interaction*, Chloride Metallurgy, 2, October 19th–23rd 2002, Montreal.
- Wanta, K.C., Astuti, W., Perdana, I., Petrus, H.T.B.M., 2020, Kinetic study in atmospheric pressure organic acid leaching: shrinking core model versus lump model, *Minerals*, 10(7), 613.
- Wetchakun, N., Incessungvorn, B., Wetchakun, K., Phanichphant, S., 2012, Influence of calcination temperature on anatase to rutile phase transformation in TiO₂ nanoparticles synthesized by the modified sol–gel method, *Mater. Lett.*, 82, 195–198.
- Wu, F., Li, X., Wang, Z., Wu, L., Guo, H., Xiong, X., Zhang, X., Wang, X., 2011, Hydrogen peroxide leaching of hydrolyzed titania residue prepared from mechanically activated Panzhihua ilmenite leached by hydrochloric acid, *Inter. J. Min. Process.*, 98(1–2), 106–112.
- Yalcin, M., 2022, The effect of pH on the physical and structural properties of TiO₂ nanoparticles, *J. Cryst. Growth.*, 585(5), 1–7.
- Yang, F., Hlavacek, V., 2000, Effective Extraction of Titanium from Rutile by a Low-Temperature Chloride Process, *AIChE J.*, 46(2), 355–360.
- Yu, J.G., Yu, J.C., Leung, M.K.P., Zhao, X.J., Ho, W.K., Zhao, J.C., 2003, Effects of acidic and basic hydrolysis catalysts on the photocatalytic activity and microstructures of bimodal mesoporous titania, *J. Catal.*, 217(1), 69–78.
- Zhai, Y., Hunting, E.R., Liu, G., Baas, E., Peijnenburg, W.J.G.M., Vijver, M.G., 2019, Compositional Alterations in Soil Bacterial Communities Exposed to TiO₂ Nanoparticles Are Not Reflected in Functional Impacts, *Environ. Res.*, 178, 108713.

- Zhang, J., Wen, X., Yang, X., Chen, C., Cheng, F., 2024, Effect of calcination temperature of titanium dioxide (TiO_2) on adsorption performance of doxycycline hydrochloride, *Desalin. Water Treat.*, 317, 100113.
- Zhang, L., Hu, H., Liao, Z., Chen, Q., Tan, J., 2011, Hydrochloric acid leaching behavior of different treated Panxi ilmenite concentrations, *Hydrometallurgy*, 107, 40–47.
- Zhang, S., Nicol, M.J., 2010, Kinetics of the dissolution of ilmenite in sulfuric acid solutions under reducing conditions, *Hydrometallurgy*, 103(1–4), 196–204.
- Zhu, T., Gao, S.-P., 2014, The Stability, Electronic Structure, and Optical Property of TiO_2 Polymorphs, *J. Phys. Chem. C*, 118(21), 11385–11396.
- Zhu, X., Zheng, S., Zhang, Y., Fang, Z. Z., Zhang, M., Sun, P., Li, Q., Zhang, Y., Li, P., Jin, W., 2019, Potentially More Ecofriendly Chemical Pathway for Production of High-Purity TiO_2 from Titanium Slag, *ACS Sustain. Chem. Eng.*, 7(5), 4821–4830.
- Žerjav, G., Žižek, K., Zavašnik, J., Pintar, A., 2022, Brookite vs. rutile vs. anatase: What's behind their various photocatalytic activities?, *J. Environ. Chem. Eng.*, 10(3), 107722.