



DAFTAR PUSTAKA

- Abdullah, A. M., Gracia-Pinilla, M. A., Pillai, S. C., dan O'Shea, K., 2019, UV and visible light-driven production of hydroxyl radicals by reduced forms of N, F, and P codoped titanium dioxide, *Molecules*, 24(11), 2147.
- Aini, N., Ningsih, R., Maulina, D., dan Chasanah, S. N., 2018, Visible light driven photocatalyst of vanadium (V^{3+}) doped TiO₂ synthesized using sonochemical method, *IOP Conference Series: Materials Science and Engineering*, 333, 1.
- Alemu, A., Gabbiye, N., dan Lemma, B., 2021, Evaluation of tannery wastewater treatment by integrating vesicular basalt with local plant species in a constructed wetland system, *Frontiers in Environmental Science*, 9, 721014.
- Ali, T., Tripathi, P., Azam, A., Raza, W., Ahmed, A. S., Ahmed, Adan Muneer, M., 2017, Photocatalytic performance of Fe-doped TiO₂ nanoparticles under visible-light irradiation, *Materials Research Express*, 4(1), 015022.
- Ansari, S.A., Khan, M.M., Ansari, M.O., dan Cho, M.H., 2016, Nitrogen-doped titanium dioxide (N-doped TiO₂) for visible light photocatalysis, *New J. Chem.*, 40, 3000-3009.
- Asuquo, E., Martin, A., Nzerem, P., Siperstein, F., and Fan, X., 2017, Adsorption of Cd(II) and Pb(II) ions from aqueous solutions using mesoporous activated carbon adsorbent: Equilibrium, kinetics and characterisation studies, *J Environ Chem Eng*, 5, 679–698.
- Aviles, G. O., Espino-Valencia J, Romero-Romero R, Rico-Cerda JL, Arroyo-Albiter M, Solís-Casados DA, Natividad-Rangel R., 2018, Enhanced Photocatalytic Activity of Titania by Co-Doping with Mo and W, *Catalysts*, 8(12), 631.
- Bansal, J., Tabassum, R., Swami, S. K., Bishnoi, S., Vashishtha, P., Gupta, G., dan Hafiz, A. K., 2020, Performance analysis of anomalous photocatalytic activity of Cr-doped TiO₂ nanoparticles [Cr (x) TiO₂ (1-x)], *Applied Physics A*, 126, 1-10.
- Bard, A., 2017, *Standard potentials in aqueous solution*, Routledge, New York.
- Bokuniaeva, A. O., dan Vorokh, A. S., 2019, Estimation of particle size using the Debye equation and the Scherrer formula for polyphasic TiO₂ powder, *journal of physics: Conference series* 1410, 1.



- Bsiri, N., Zrir, M. A., Bardaoui, A., dan Bouaïcha, M., 2016, Morphological, structural and ellipsometric investigations of Cr doped TiO₂ thin films prepared by sol-gel and spin coating, *Ceramics International*, 42(9), 10599-10607.
- Buljan, J., Kral, I., dan Clonfero, G., 2011, *Introduction to treatment of tannery effluents*, UNIDO, Vienna.
- Charkiewicz, A.E., dan Backstrand, J.R., 2020, Lead Toxicity and Pollution in Poland, *Int. J. Env. Res. Pub. Health*, 17, 12.
- Chaudhari, S. M., Gawal, P. M., Sane, P. K., Sontakke, S. M., dan Nemade, P. R., 2018, Solar light-assisted photocatalytic degradation of methylene blue with Mo/TiO₂: A comparison with Cr-and Ni-doped TiO₂, *Research on Chemical Intermediates*, 44, 3115-3134.
- Chen, X., dan Mao, S.S., 2007, Titanium dioxide nanomaterials: Synthesis, properties, modifications and applications, *Chem. Rev.*, 107, 2891-2959.
- Chen, X., & Zhu, H., 2010, Catalysis by Supported Gold Nanoparticles, *Comprehensive Nanoscience and Technology*, 1-11.
- Chen, Y. W., dan Hsu, Y. H, 2021, Effects of reaction temperature on the photocatalytic activity of TiO₂ with Pd and Cu cocatalysts, *Catalysts*, 11(8), 966.
- Cheng, X., Yu, X., Xing, Z., dan Wan, J., 2012, Enhanced Photocatalytic Activity of Nitrogen Doped TiO₂ Anatase Nano-Particle under Simulated Sunlight Irradiation, *Energy Procedia*, 16, 598-605.
- Dawson, M., Soares, G. B., dan Ribeiro, C., 2014, Influence of calcination parameters on the synthesis of N-doped TiO₂ by the polymeric precursors method, *Journal of Solid State Chemistry*, 215, 211-218.
- Du, S., Lian, J., dan Zhang, F., 2021, Visible light-responsive N-doped TiO₂ photocatalysis: Synthesis, characterizations, and applications, *Transactions of Tianjin University*, 1-20.
- Dubey, R. S., dan Singh, S., 2017, Investigation of structural and optical properties of pure and chromium doped TiO₂ nanoparticles prepared by solvothermal method, *Results in physics*, 7, 1283-1288.
- Fatehizadeh, A., Rahimi, S., Ahmadian, M., Barati, R., Yousefi, N., and Moussavi, S., 2014, Photocatalytic Removal of Cadmium (II) and Lead (II) from Simulated Wastewater at Continuous and Batch System, *Int. J. Environ. Health Eng.*, 3, 31.



- Fernandez, P. M., Lucia, I. C., Figueroa, Julia, I., dan Farina, 2009, Critical Influence of Culture Medium and Cr(III) Quantification Protocols on the Interpretation of Cr(VI) Bioremediation by Environmental Fungal Isolates, *Water Air Soil Pollut*, 206, 283-293.
- Filippatos, P. P., Kelaidis, N., Vasilopoulou, M., Davazoglou, D., dan Chroneos, A., 2021, Structural, electronic, and optical properties of group 6 doped anatase TiO₂: a theoretical approach, *Applied Sciences*, 11(4), 1657.
- Fu, Q., 2002, Radiation (SOLAR), *Encyclopedia of Atmospheric Sciences*, 1859-1863.
- Ghumro, S. S., Lal, B., dan Pirzada, T., 2022, Visible-light-driven carbon-doped TiO₂-based nanocatalysts for enhanced activity toward microbes and removal of dye, *ACS omega*, 7(5), 4333-4341.
- Greenwood, N. N., dan Earnshaw, A., 1998, *Chemistry of the Elements (edisi kedua)*, Butterworth-Heinemann, UK.
- Guo, Q., Zhou, C., Ma, Z., dan Yang, X., 2019, Fundamentals of TiO₂ photocatalysis: concepts, mechanisms, and challenges, *Advanced Materials*, 31(50), 1901997.
- Helmy, E. T., Abouellef, E. M., Soliman, U. A., dan Pan, J. H., 2021, Novel green synthesis of S-doped TiO₂ nanoparticles using Malva parviflora plant extract and their photocatalytic, antimicrobial and antioxidant activities under sunlight illumination, *Chemosphere*, 271, 129524.
- Herald, E., Purnamawati, N., Hidayat, Y., Noegrahaningtyas, K. D., dan Nurcahyo, I. F., 2022, Preparation of Biosorbent from Kapok Fruit Peel (*Ceiba pentandra*) for Adsorption of Lead Waste, *Jurnal Kimia Sains dan Aplikasi*, 25(9), 329-337.
- Hossain, M. K., Hossain, M. M., dan Akhtar, S., 2023, Studies on Synthesis, Characterization, and Photocatalytic Activity of TiO₂ and Cr-Doped TiO₂ for the Degradation of p-Chlorophenol, *ACS omega*, 8(2), 1979-1988.
- Ibrahim, I. A., Ismail, A. A., dan Mohamed, R. M., 2003, Degradation of free cyanide by photocatalytic oxidation, *European Journal of Mineral Processing and Environmental Protection*, 3(3).
- Ilou, I., Souabi, S., dan Digua, K., 2014, Quantification of pollution discharges from tannery wastewater and pollution reduction by pre-treatment station, *Int. J. Sci. Res*, 3(5), 1706-1715.
- Ismail, A. A., dan Bahnemann, D. W., 2014, Photochemical Splitting of Water for Hydrogen Production by Photocatalysis, *Sol. Energy Mater. Sol. Cells*, 128, 85–101.



- Khan, S., Ruwer, T. L., Khan, N., Köche, A., Lodge, R. W., Coelho-Júnior, H., dan Fernandes, J. A., 2021, Revealing the true impact of interstitial and substitutional nitrogen doping in TiO₂ on photoelectrochemical applications, *Journal of Materials Chemistry A*, 9(20), 12214-12224.
- Khlyustova, A., Sirotkin, N., Kusova, T., Kraev, A., Titov, V., & Agafonov, A., 2020, Doped TiO₂: The effect of doping elements on photocatalytic activity, *Materials Advances*, 1(5), 1193-1201.
- Krishna, K. R., dan Philip, L., 2005, Bioremediation of Cr(VI) in contaminated soils, *Journal of Hazardous Materials*, 121(1), 109-117.
- Kumar, A., dan Pandey, G, 2017, The photocatalytic degradation of methyl green in presence of visible light with photoactive Ni0. 10: La0. 05: TiO₂ nanocomposites, *IOSR Journal of Applied Chemistry*, 10(9), 31-44.
- Kumar, A., Kumar, A., Chaturvedi, A. K., Shabnam, A. A., Subrahmanyam, G., dan Yadav, K. K., 2020, Lead toxicity: health hazards, influence on food chain, and sustainable remediation approaches, *International journal of environmental research and public health*, 7, 2179.
- Kutuzova, A., Dontsova, T., dan Kwapinski, W., 2021, Application of TiO₂-based photocatalysts to antibiotics degradation: cases of sulfamethoxazole, trimethoprim and ciprofloxacin, *Catalysts*, 11(6), 728.
- Li, X., Guo, Z., dan He, T., 2013, The doping mechanism of Cr into TiO₂ and its influence on the photocatalytic performance, *Physical Chemistry Chemical Physics*, 15, 20037-20045.
- Li, X., Guo, Z., dan He, T., 2013, The doping mechanism of Cr into TiO₂ and its influence on the photocatalytic performance, *Physical Chemistry Chemical Physics*, 15(46), 20037-20045.
- Liu, H., Kuznetsov, A. M., Masliy, A. N., Ferguson, J. F., dan Korshin, G. V., 2012, Formation of Pb (III) intermediates in the electrochemically controlled Pb(II)/PbO₂ system, *Environmental science dan technology*, 46(3), 1430-1438.
- Lubis, S., dan Sitompul, D. W., 2019, Photocatalytic degradation of indigo carmine dye using α -Fe₂O₃/bentonite nanocomposite prepared by mechanochemical synthesis, *IOP Conference Series: Materials Science and Engineering*, 509(1), 012142
- Maharana, M., dan Sen, S., 2021, Magnetic zeolite: A green reusable adsorbent in wastewater treatment, *Materials Today: Proceedings*, 47, 1490-1495.
- Malengreaux, C. M., Pirard, S. L., Leonard, G., Mahy, J. G., Herlitschke, M., Klobes, B., dan Bartlett, J. R., 2017, Study of the photocatalytic activity



of Fe³⁺, Cr³⁺, La³⁺ and Eu³⁺ single-doped and co-doped TiO₂ catalysts produced by aqueous sol-gel processing, *Journal of alloys and compounds*, 691, 726-738

Mani, R., dan Gupta, S. K., 2020, Effect of hydrothermal temperature treatment on the variance of fluorescence in Ca₂SiO₄: Tb³⁺, *Journal of Science: Advanced Materials and Devices*, 5(2), 250-255.

Markose, A., Das, D., Ravindran, P., 2023, Quantitative framework development for understanding the relationship between doping and photoelectrochemical energy conversion of TiO₂, *Material Advances*, 4, 3399-3451.

Maryudi, Rahayu, A., Syauqi, R., Islami, M. K., 2021, Teknologi Pengolahan Kandungan Kromium dalam Limbah Penyamakan Kulit Menggunakan Proses Adsorpsi: Review, *J. Tek. Kim. Ling.*, 5, 90-99.

Meija, J., Coplen, T. B., Berglund, M., Brand, W. A., De Bièvre, P., Gröning, M., dan Prohaska, T., 2016, Atomic weights of the elements 2013 (IUPAC Technical Report), *Pure and Applied Chemistry*, 88(3), 265-291.

Mendiola-Alvarez, S. Y., Guzmán-Mar, J. L., Turnes-Palomino, G., Maya-Alejandro, F., Hernández-Ramírez, A., dan Hinojosa-Reyes, L., 2017, UV and visible activation of Cr(III)-doped TiO₂ catalyst prepared by a microwave-assisted sol-gel method during MCPA degradation, *Environmental Science and Pollution Research*, 24, 12673-12682.

Mingmongkol, Y., Trinh, D. T. T., Phuinthiang, P., Channei, D., Ratananikom, K., Nakaruk, A., dan Khanitchaidecha, W., 2022, Enhanced photocatalytic and photokilling activities of Cu-doped TiO₂ nanoparticles. *Nanomaterials*, 12(7), 1198.

Mishra, T., Hait, J., Aman, N., Jana, R. K., dan Chakravarty, S., 2007, Effect of UV and visible light on photocatalytic reduction of lead and cadmium over titania based binary oxide materials, *Journal of Colloid and Interface Science*, 316(1), 80-84.

Mostafa, N. G., Yunnus, A. F., Elawwad, A., 2022, Adsorption of Pb(II) from Water onto ZnO, TiO₂, and Al₂O₃: Process Study, Adsorption Behaviour, and Thermodynamics, *Adsorption Science dan Technology*, 1-13.

Nguyen, T., dan Hind, A. R., 2014, The measurement of absorption edge and band gap properties of novel nanocomposite materials, *Varian Cary, 500*.

Niu, Z., Zhang, S., Ma, M., Wang, Z., Zhao, H., dan Wang, Y., 2019, Synthesis of novel waste batteries-sawdust-based adsorbent via a two-stage



activation method for Pb²⁺ removal, *Environmental Science and Pollution Research*, 26, 4730-4745.

Nora, M., 2023, Fotodegradasi Amoksisilin menggunakan TiO₂ Terdoping Cr dari Air Limbah Penyamakan Kulit di Bawah Paparan Sinar Tampak, *Skripsi*, Kimia FMIPA UGM, Yogyakarta.

Omidi, A. H., Cheraghi, M., Lorestani, B., Sobhanardakani, S., dan Jafari, A., 2019, Biochar obtained from cinnamon and cannabis as effective adsorbents for removal of lead ions from water, *Environmental Science and Pollution Research*, 26, 27905-27914.

Owino, C. O., Nthiga, E. W., Muthakia, G. K., dan Onyancha, D., 2021, *Removal of Cr³⁺ From Tannery Wastewater Using Unmodified And Acid-Modified Arabica Coffee Husk Adsorbent*, Dedan Kimathi University of Technology, Kenya.

Ozimek, M., Palewicz, M., dan Hreniak, A., 2016, Optical Properties of TiO₂ Nanopowder Doped by Silver (Copper) during Synthesis or PVD Method, *Acta Physica Polonica A*, 129(6), 1214-1219.

Pawar, M. J., Nimbalkar, V. B., Gaonar, M. D., Khajone, A. D., dan Deshmukh, S. B., 2021, Cr-Doped TiO₂:Synthesis and Photodegradation of Methylene Blue Dye, *IOSR-JAC*, 14, 54-62.

Pelaez, M., Nolan, N.T., Pillai, S.C., Seery, M.K., Falaras, P., Kontos, A.G., dkk, 2012, A review on the visible light active titanium dioxide photocatalysts for environmental applications, *Appl. Catal. B Environ.*, 125, 331-349.

Perillo, P. M., dan Rodriguez, D. F., 2021, Photocatalysis of Methyl Orange using free standing TiO₂ nanotubes under solar light. *Environmental Nanotechnology, Monitoring dan Management*, 16, 100479.

Phonsy, P. D., Anju, S. G., Jyothi, K. P., Yesodharan, S., dan Yesodharan, E. P., 2015, Semiconductor mediated photocatalytic degradation of plastics and recalcitrant organic pollutants in water: effect of additives and fate of insitu formed H₂O₂, *Journal of Advanced Oxidation Technologies*, 18(1), 85-97.

Poljsak, B., Pocsi, I., Raspov, P., dan Pesti, M., 2010, Interference of chromium with biological systems in yeasts and fungi: A review, *Journal of Basic Microbiology*, 50(1), 21-36.

Ren, R., Wen, Z., Cui, S., Hou, Y., Guo, X., dan Chen, J., 2015, Controllable synthesis and tunable photocatalytic properties of Ti³⁺-doped TiO₂, *Scientific reports*, 5(1), 10714.



- Rescigno, R., Sacco, O., Venditto, V., Fusco, A., Donnarumma, G., Lettieri, M., dan Vaiano, V., 2023, Photocatalytic activity of P-doped TiO₂ photocatalyst, *Photochemical and Photobiological Sciences*, 1-9.
- Riadi, L., Tanuwijaya, A., Je, R., dan Altway, A., 2021, Fenton's Oxidation of Personal Care Product (PCP) Wastewater: A Kinetic Study and the Effects of System Parameters, *International Journal of Technology*, 12(2), 298-308.
- Rincon, A. G., dan Pulgarin, C., 2004, Effect of pH, inorganic ions, organic matter and H₂O₂ on E. coli K12 photocatalytic inactivation by TiO₂: implications in solar water disinfection, *Applied Catalysis B: Environmental*, 51(4), 283-302.
- Rosario, A. V., dan Pereira, E. C., 2014, The role of Pt addition on the photocatalytic activity of TiO₂ nanoparticles: The limit between doping and metallization, *Applied Catalysis B: Environmental*, 144, 840-845.
- Saleh, S., Mohammadnejad, S., Khorgooei, H., dan Otadi, M., 2021, Photooxidation/adsorption of arsenic (III) in aqueous solution over bentonite/chitosan/TiO₂ heterostructured catalyst, *Chemosphere*, 280, 130583.
- Scanlon, D. O., Dunnill, C. W., Buckeridge, J., Shevlin, S. A., Logsdail, A. J., Woodley, S. M., dan Sokol, A. A., 2013, Band alignment of rutile and anatase TiO₂, *Nature materials*, 12(9), 798-801.
- Schneider, J., Matsuoka, M., Takeuchi, M., Zhang, J., Horiuchi, Y., Anpo, M., dan Bahnemann, D. W., 2014, Understanding TiO₂ photocatalysis: mechanisms and materials, *Chemical reviews*, 114(19), 9919-9986.
- Shi, Q., Sterbinsky, G. E., Prigobbe, V., dan Meng, X., 2018, Mechanistic study of lead adsorption on activated carbon, *Langmuir*, 34(45), 13565-13573.
- Singh, A., dan Kumar, S., 2021, Study of pure and Ag-doped TiO₂ nanoparticles for photocatalytic degradation of methylene blue, *IOP Conference Series: Materials Science and Engineering*, 1033(1), 012050
- Soliman, A.M., Elwy, H.M., Thiemann, T., Majedi, Y., Labata, F.T., and Al-Rawashdeh, N.A.F., 2016, Removal of Pb(II) ions from aqueous solutions by sulphuric acid-treated palm tree leaves, *J Taiwan Inst Chem Eng*, 58, 264–273.
- Sujatha, G., Shanthakumar, S., dan Chiampo, F., 2020, UV light-irradiated photocatalytic degradation of coffee processing wastewater using TiO₂ as a catalyst, *Environments*, 7(6), 47.



- Sun, H., Biedermann, L., dan Bond, T. C., 2007, Color of brown carbon: A model for ultraviolet and visible light absorption by organic carbon aerosol, *Geophysical Research Letters*, 34(17).
- Suwondo, K. P., Aprilita, N. H., dan Wahyuni, E. T., 2022, Enhancement of TiO₂ photocatalytic activity under visible light by doping with Cu from electroplating wastewater. *Reaction Kinetics, Mechanisms and Catalysis*, 135(1), 479-497.
- Wahyuni E. T., Supraba D, Raharjo S, and Siswanta D, 2019, A Study on Photo-Fenton Method for Simultaneous and Synergic Decreasing Concentration of Pb(II) and Cu(II) in the Solution, *Jurnal Kimia Sains dan Aplikasi*, 22, 192–199.
- Wahyuni, E. T., Mochammad, R. S., Mahira, N. S., Lestari, N. D., Syoufian, A., dan Nasir, T. A., 2022, Enhancement of TiO₂ activity under visible light by doping S element from sulfur core for Pb (II) photo-oxidation, *Reaction Kinetics, Mechanisms and Catalysis*, 135(5), 2783-2796.
- Wahyuni, E. T., Siswanta, D., Kunarti, E. S., Supraba, D., dan Budiraharjo, S., 2019, Removal of Pb (II) ions in the aqueous solution by photo-Fenton method, *Global NEST J*, 21, 180-186.
- Wahyuni, E. T., Wahyuni, S., Lestari, N. D., dan Suherman, S., 2023, Utilization of tannery wastewater as a source of Cr doped into TiO₂ for improving its activity under visible light in the Congo red degradation, *Reaction Kinetics, Mechanisms and Catalysis*, 136(2), 1067-1084.
- Wang, X., dan Zhang, L., 2018, Kinetic study of hydroxyl radical formation in a continuous hydroxyl generation system, *RSC advances*, 8(71), 40632-40638.
- Wang, Y., Wu, J., Wang, Z., Terenyi, A., dan Giammar, D. E., 2013, Kinetics of lead (IV) oxide (PbO₂) reductive dissolution: Role of lead (II) adsorption and surface speciation, *Journal of colloid and interface science*, 389(1), 236-243.
- Wani, A. L., Ara, A., dan Usmani, J. A., 2015, Lead toxicity, a review, 8(2), 55-64.
- Wu, X., 2021, Applications of titanium dioxide materials, *Titanium Dioxide—Advances and Applications*, Saudi Arabia
- Yang, M., Chang, B., dan Rao, W., 2016, Relationship of the longer wavelength threshold and the narrower surface band gap: for GaN and GaAlN photocathodes, *Optik*, 127(22), 10710-10715.



Yao, S., Zhang, J., Shen, D., Xiao, R., Gu, S., Zhao, M., and Liang, J., 2016, Removal of Pb(II) from water by the activated carbon modified by nitric acid under microwave heating, *J Colloid Interface Sci*, 463, 118–127.

Yuan, L., Weng, X., Zhou, M., Zhang, Q., dan Deng, L., 2017, Structural and Visible-Near Infrared Optical Properties of Cr-Doped TiO₂ for Colored Cool Pigments, *Nanoscale research letters*, 12(1), 597.

Yuvaraja, G., Krishnaiah, N., Subbaiah, M.V., and Krishnaiah, A., 2014, Biosorption of Pb(II) from aqueous solution by Solanum melongena leaf powder as a low-cost biosorbent prepared from agricultural waste, *Colloids Surf B Biointerfaces*, 114, 75–81.

Zerjav, G., Zizek, K., Zavasnik, J., dan Pintar, A., 2022, Brookite vs. rutile vs. anatase: Whats behind their various photocatalytic activities?, *Journal of Environmental Chemical Engineering*, 10(3), 107722.

Zeshan, M., Bhatti, I. A., Mohsin, M., Iqbal, M., Amjad, N., Nisar, J., dan Alomar, T. S., 2022, Remediation of pesticides using TiO₂ based photocatalytic strategies: A review, *Chemosphere*, 300, 134525.

Zhao, H., Ouyang, X. K., dan Yang, L. Y., 2021, Adsorption of lead ions from aqueous solutions by porous cellulose nanofiber–sodium alginate hydrogel beads, *Journal of Molecular Liquids*, 324, 115122.

Zulfiqar, M., Samsudin, M. F. R., dan Sufian, S., 2019, Modelling and optimization of photocatalytic degradation of phenol via TiO₂ nanoparticles: An insight into response surface methodology and artificial neural network, *Journal of Photochemistry and Photobiology A: Chemistry*, 384, 112039.