

## DAFTAR PUSTAKA

- Abd Mutalib, M., Rahman, M., Othman, M., Ismail, A. F., & Jaafar, J. (2017). Scanning electron microscopy (SEM) and energy-dispersive X-ray (EDX) spectroscopy. In *Membrane characterization* (pp. 161-179): Elsevier. doi:<https://doi.org/10.1016/B978-0-444-63776-5.00009-7>
- Abdelfattah, I., & El-Shamy, A. M. (2024a). A comparative study for optimizing photocatalytic activity of TiO<sub>2</sub>-based composites with ZrO<sub>2</sub>, ZnO, Ta<sub>2</sub>O<sub>5</sub>, SnO, Fe<sub>2</sub>O<sub>3</sub>, and CuO additives. *Scientific Reports*, *14*(1). doi:<https://doi.org/10.1038/s41598-024-77752-5>
- Abdelfattah, I., & El-Shamy, A. M. (2024b). A comparative study for optimizing photocatalytic activity of TiO<sub>2</sub>-based composites with ZrO<sub>2</sub>, ZnO, Ta<sub>2</sub>O<sub>5</sub>, SnO, Fe<sub>2</sub>O<sub>3</sub>, and CuO additives. *Scientific Reports*, *14*(1), 27175. doi:<https://doi.org/10.1038/s41598-024-77752-5>
- Abu-Bakr, A. F. (2023). Theoretical and Numerical Investigation of Acoustic Cavitation Bubble Based on the Impact of Ultrasound Frequency. *Bulletin of the Russian Academy of Sciences: Physics*, *87*(Suppl 3), S341-S347. doi:<https://doi.org/10.1134/S1062873823705688>
- Ahmad, I., Athar, M. S., Muneer, M., Altass, H. M., Felemban, R. F., & Ahmed, S. A. (2024). Graphene oxide decorated BiOI/CdS nanocomposite: An efficient ternary heterostructure for photodegradation and adsorption study of organic pollutants. *Surfaces and Interfaces*, *45*. doi:<https://doi.org/10.1016/j.surfin.2023.103819>
- Al-Gaashani, R., Najjar, A., Zakaria, Y., Mansour, S., & Atieh, M. J. C. I. (2019). XPS and structural studies of high quality graphene oxide and reduced graphene oxide prepared by different chemical oxidation methods. *45*(11), 14439-14448. doi:<https://doi.org/10.1016/j.ceramint.2019.04.165>
- Al-Tohamy, R., Ali, S. S., Li, F., Okasha, K. M., Mahmoud, Y. A.-G., Elsamahy, T., safety, e. (2022). A critical review on the treatment of dye-containing wastewater: Ecotoxicological and health concerns of textile dyes and possible remediation approaches for environmental safety. *231*, 113160. doi:<https://doi.org/10.1016/j.ecoenv.2021.113160>
- Al Miad, A., Saikat, S. P., Alam, M. K., Sahadat Hossain, M., Bahadur, N. M., & Ahmed, S. (2024). Metal oxide-based photocatalysts for the efficient degradation of organic pollutants for a sustainable environment: a review. *Nanoscale Advances*, *6*(19), 4781-4803. doi:<https://doi.org/10.1039/d4na00517a>
- Alam, K. J. A. a. S. (2024). Structural, Electronic, and Optical Properties of Chromium Oxynitride Thin Films Grown by RF Magnetron Sputtering.
- Alderton, D. J. E. o. G. (2021). X-ray diffraction (XRD). 520-531. doi:<https://doi.org/10.1016/B978-0-08-102908-4.00178-8>
- Ali, A., Zhang, N., & Santos, R. M. J. A. S. (2023). Mineral characterization using scanning electron microscopy (SEM): a review of the fundamentals, advancements, and research directions. *13*(23), 12600. doi:<https://doi.org/10.3390/app132312600>

- AlMohamadi, H., Awad, S. A., Sharma, A. K., Fayzullaev, N., Tavora-Aponte, A., Chiguala-Contreras, L., Esmaili, H. J. C. (2024). Photocatalytic activity of metal-and non-metal-anchored ZnO and TiO<sub>2</sub> nanocatalysts for advanced photocatalysis: comparative study. *14*(7), 420. doi:<https://doi.org/10.3390/catal14070420>
- Angelin, E. M., Oliveira, M. C., Nevin, A., Picollo, M., & Melo, M. J. (2021). To be or not to be an azo pigment: Chemistry for the preservation of historical  $\beta$ -naphthol reds in cultural heritage. *Dyes and Pigments*, *190*. doi:<https://doi.org/10.1016/j.dyepig.2021.109244>
- Anjum, F., Shaban, M., Ismail, M., Gul, S., Bakhsh, E. M., Khan, M. A., . . . Khan, M. I. (2023). Novel Synthesis of CuO/GO Nanocomposites and Their Photocatalytic Potential in the Degradation of Hazardous Industrial Effluents. *ACS Omega*, *8*(20), 17667-17681. doi:<https://doi.org/10.1021/acsomega.3c00129>
- Ansari, A. S., Azzahra, G., Nugroho, F. G., Mujtaba, M. M., & Ahmed, A. T. A. J. C. (2025). Oxides and metal oxide/carbon hybrid materials for efficient photocatalytic organic pollutant removal. *15*(2), 134. doi:<https://doi.org/10.3390/catal15020134>
- Antonopoulou, M., Kosma, C., Albanis, T., & Konstantinou, I. J. S. o. t. t. e. (2021). An overview of homogeneous and heterogeneous photocatalysis applications for the removal of pharmaceutical compounds from real or synthetic hospital wastewaters under lab or pilot scale. *765*, 144163. doi:<https://doi.org/10.1016/j.scitotenv.2020.144163>
- Aromaa, J., Kekkonen, M., Mousapour, M., Jokilaakso, A., & Lundström, M. (2021). The Oxidation of Copper in Air at Temperatures up to 100 °C. *Corrosion and Materials Degradation*, *2*(4), 625-640. doi:<https://doi.org/10.3390/cmd2040033>
- Assaouka, H. T., Daawe, D. M., Fomekong, R. L., Nsangou, I. N., & Kouotou, P. M. J. H. (2022). Inexpensive and easily replicable precipitation of CuO nanoparticles for low temperature carbon monoxide and toluene catalytic oxidation. *8*(9). doi:<https://doi.org/10.1016/j.heliyon.2022.e10689>
- Baig, A., Siddique, M., & Panchal, S. J. C. (2025). A review of visible-light-active zinc oxide photocatalysts for environmental application. *15*(2), 100. doi:<https://doi.org/10.3390/catal15020100>
- Bakhtiar Azim, M., Arafat Tanim, I., Morshed Rezaul, R., Tareq, R., Hossain Rahul, A., Kurny, A., & Gulshan, F. J. a. e.-p. (2018). Degradation of Methylene Blue using Graphene Oxide-Tin Oxide Nanocomposite as Photocatalyst. arXiv: 1806.06481. doi:<https://doi.org/10.48550/arXiv.1806.06481>
- Barhoum, A., García-Betancourt, M. L. J. E. A. o. N., Prospects, A. N. C., & Trends, F. (2018). Physicochemical characterization of nanomaterials: Size, morphology, optical, magnetic, and electrical properties. *279-304*. doi:<https://doi.org/10.1016/B978-0-323-51254-1.00010-5>
- Bibi, I., Muneer, M., Iqbal, M., Alwadai, N., Almuqrin, A. H., Altowyan, A. S., Slimani, Y. J. C. I. (2021). Effect of doping on dielectric and optical properties of barium hexaferrite: photocatalytic performance under solar

- light irradiation. 47(22), 31518-31526.  
doi:<https://doi.org/10.1016/j.ceramint.2021.08.030>
- Bissenova, M., Idrissov, N., Kuspanov, Z., Umirzakov, A., Daulbayev, C. J. M. f. R., & Energy, S. (2025). Hybrid adsorption–photocatalysis composites: a sustainable route for efficient water purification. *14*(2), 1-26.  
doi:<https://doi.org/10.1007/s40243-025-00319-5>
- Blomberg, E., Wang, X., Herting, G., Khort, A., Arora, A., Buxton, S., Odnevall, I. J. P. O. (2025). Effects of sonication on particle dispersions from a size, biodissolution, cytotoxicity and transferred dose perspective—a case study on nickel and nickel oxide particles. *20*(5), e0323368.  
doi:<https://doi.org/10.1371/journal.pone.0323368>
- Brusko, V., Khannanov, A., Rakhmatullin, A., & Dimiev, A. M. J. C. (2024). Unraveling the infrared spectrum of graphene oxide. *229*, 119507.  
doi:<https://doi.org/10.1016/j.carbon.2024.119507>
- Campos-Delgado, J., & Mendoza, M. E. (2024). Ternary Graphene Oxide and Titania Nanoparticles-Based Nanocomposites for Dye Photocatalytic Degradation: A Review. *Materials*, *17*(1).  
doi:<https://doi.org/10.3390/ma17010135>
- Carnio, B. N., Moutanabbir, O., & Elezzabi, A. Y. (2023). Methodology for computing Fourier-transform infrared spectroscopy interferograms. *Applied Optics*, *62*(17), 4518-4523. doi:<https://doi.org/10.1364/AO.492071>
- Chai, J., Zhang, K., Xue, Y., Liu, W., Chen, T., Lu, Y., & Zhao, G. J. M. (2020). Review of MEMS based Fourier transform spectrometers. *11*(2), 214.  
doi:<https://doi.org/10.3390/mi11020214>
- Chan, Y. B., Selvanathan, V., Tey, L. H., Akhtaruzzaman, M., Anur, F. H., Djearamane, S., Aminuzzaman, M. (2022). Effect of Calcination Temperature on Structural, Morphological and Optical Properties of Copper Oxide Nanostructures Derived from *Garcinia mangostana* L. Leaf Extract. *Nanomaterials (Basel)*, *12*(20). doi:<https://doi.org/10.3390/nano12203589>
- Charlena, C., Sugiarti, S., & Ardiansyah, D. J. J. K. M. (2024). Synthesis and Characterization of Copper (II) Oxide (CuO-NP) Nanoparticles using Chemical Precipitation Method. *21*(2), 84.  
doi:<https://doi.org/10.30872/jkm.v21i2.1260>
- Chauke, N. M., Ngqalakwezi, A., & Raphulu, M. (2025). Transformative advancements in visible-light-activated titanium dioxide for industrial wastewater remediation. *International Journal of Environmental Science and Technology*, *22*(9), 8521-8552. doi:<https://doi.org/10.1007/s13762-025-06397-2>
- Cheng, Q., Debnath, S., Gregan, E., & Byrne, H. J. J. T. J. o. P. C. C. (2010). Ultrasound-assisted SWNTs dispersion: effects of sonication parameters and solvent properties. *114*(19), 8821-8827.  
doi:<https://doi.org/10.1021/jp101431h>
- Christie, R., & Abel, A. (2021). Monoazo (Monohydrazone) pigments based on 2-naphthol and derivatives. *Physical Sciences Reviews*, *6*(10), 581-605.  
doi:<https://doi.org/10.1515/psr-2020-0186>

- Collins, S., & Sieber, J. D. (2023). Development of regiodivergent asymmetric reductive coupling reactions of allenamides to access heteroatom-rich organic compounds. *Chemical Communications*, 59(67), 10087-10100. doi:<https://doi.org/10.1039/d3cc03013j>
- Cuartero, V., Monteseuro, V., Otero-de-la-Roza, A., El Idrissi, M., Mathon, O., Shinmei, T., Sanson, A. J. P. C. C. P. (2020). Interplay between local structure, vibrational and electronic properties on CuO under pressure. 22(42), 24299-24309. doi:<https://doi.org/10.1039/D0CP04878J>
- Deng, R. X., Zheng, Y. Y., Liu, D. J., Liu, J. Y., Zhang, M. N., Xi, G. Y., Liu, P. (2024). The effect of ultrasonic power on the physicochemical properties and antioxidant activities of frosted figs pectin. *Ultrason Sonochem*, 106, 106883. doi:<https://doi.org/10.1016/j.ultsonch.2024.106883>
- Devos, C., Bampouli, A., Brozzi, E., Stefanidis, G. D., Dusselier, M., Van Gerven, T., & Kuhn, S. (2024). Ultrasound mechanisms and their effect on solid synthesis and processing: a review. *Chemical Society Reviews*, 54(1), 85-115. doi:<https://doi.org/10.1039/d4cs00148f>
- Diachenko, O., Kováč, J., Dobrozhán, O., Novák, P., Kováč, J., Skrinariova, J., & Opanasyuk, A. (2021). Structural and Optical Properties of CuO Thin Films Synthesized Using Spray Pyrolysis Method. *Coatings*, 11(11). doi:<https://doi.org/10.3390/coatings11111392>
- El-Sayed, E., Abd El-Aziz, E., Othman, H., & Hassabo, A. G. J. E. J. o. C. (2024). Azo dyes: Synthesis, classification and utilisation in textile industry. 67(13), 87-97. doi:<https://doi.org/10.21608/ejchem.2024.257952.9057>
- Eroglu, S., Karaca, N., Vogel-Mikus, K., Kavčič, A., Filiz, E., & Tanyolac, B. J. F. i. p. s. (2019). The conservation of VIT1-dependent iron distribution in seeds. 10, 907. doi:<https://doi.org/10.3389/fpls.2019.00907>
- Fatimah, S., Ragadhita, R., Al Husaeni, D. F., Nandiyanto, A. B. D. J. A. J. o. S., & Engineering. (2022). How to calculate crystallite size from x-ray diffraction (XRD) using Scherrer method. 2(1), 65-76. doi:<https://doi.org/10.17509/ajse.v2i1.37647>
- Fobiri, G. K. (2022). Synthetic Dye Application in Textiles: A Review on the Efficacies and Toxicities Involved. *Textile and Leather Review*, 5, 180-198. doi:<https://doi.org/10.31881/TLR.2022.22>
- Folaranmi, G., Bechelany, M., Sifat, P., Cretin, M., & Zaviska, F. (2020). Comparative investigation of activated carbon electrode and a novel activated carbon/graphene oxide composite electrode for an enhanced capacitive deionization. *Materials*, 13(22), 1-14. doi:<https://doi.org/10.3390/ma13225185>
- Fu, L., & Zheng, Y. (2021). Metal Oxide-Based Nanocomposites Application Towards Photocatalysis. In *Metal Oxide Nanocomposites: Synthesis and Applications* (pp. 155-178). doi:<https://doi.org/10.1002/9781119364726.ch5>
- Gattinoni, C., & Michaelides, A. J. S. S. R. (2015). Atomistic details of oxide surfaces and surface oxidation: the example of copper and its oxides. 70(3), 424-447. doi:<https://doi.org/10.48550/arXiv.1508.01005>

- Gonçalves, M. G., Costa, V. O., Martinez, A. H., Régnier, B. M., Gomes, G. C., Zarbin, A. J., & Orth, E. S. J. F. i. C. (2024). Functionalization of graphene oxide via epoxide groups: a comprehensive review of synthetic routes and challenges. *3*, 1393077. doi:<https://doi.org/10.3389/frcrb.2024.1393077>
- Gond, R., Gupta, M., Singh, H., Rangappa, S. M., & Siengchin, S. (2022). Extraction and properties of cellulose for polymer composites. In *Biodegradable Polymers, Blends and Composites* (pp. 59-86): Elsevier. doi:<https://doi.org/10.1016/B978-0-12-823791-5.00011-9>
- Gong, Y., Chen, X., & Wu, W. (2024). Application of fourier transform infrared (FTIR) spectroscopy in sample preparation: Material characterization and mechanism investigation. *Advances in Sample Preparation*, *11*. doi:<https://doi.org/10.1016/j.sampre.2024.100122>
- Gontrani, L., Bauer, E. M., Talone, A., Missori, M., Imperatori, P., Tagliatesta, P., & Carbone, M. (2023). CuO Nanoparticles and Microaggregates: An Experimental and Computational Study of Structure and Electronic Properties. *Materials (Basel)*, *16*(13). doi:<https://doi.org/10.3390/ma16134800>
- Guillén, C. (2025). Band Gap Energy and Lattice Distortion in Anatase TiO<sub>2</sub> Thin Films Prepared by Reactive Sputtering with Different Thicknesses. *Materials (Basel)*, *18*(10). doi:<https://doi.org/10.3390/ma18102346>
- Gutiérrez-Cruz, A., Ruiz-Hernández, A. R., Vega-Clemente, J. F., Luna-Gazcón, D. G., & Campos-Delgado, J. J. J. o. M. S. (2022). A review of top-down and bottom-up synthesis methods for the production of graphene, graphene oxide and reduced graphene oxide. *57*(31), 14543-14578. doi:<https://doi.org/10.1007/s10853-022-07514-z>
- Hanifah, M. F. R., Jaafar, J., Othman, M., Ismail, A., Rahman, M. A., Yusof, N., Aziz, F. J. M. (2019). Facile synthesis of highly favorable graphene oxide: Effect of oxidation degree on the structural, morphological, thermal and electrochemical properties. *6*, 100344. doi:<https://doi.org/10.1016/j.mtla.2019.100344>
- Harijan, D. K., Gupta, S., Ben, S. K., Srivastava, A., Singh, J., & Chandra, V. J. P. B. C. M. (2022). High photocatalytic efficiency of  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>-ZnO composite using solar energy for methylene blue degradation. *627*, 413567. doi:<https://doi.org/10.1016/j.physb.2021.413567>
- Hashimoto, K., Badarla, V. R., & Ideguchi, T. (2021). High-Speed Fourier-Transform Infrared Spectroscopy with Phase-Controlled Delay Line. *Laser and Photonics Reviews*, *15*(1). doi:<https://doi.org/10.1002/lpor.202000374>
- Hassan, M. A., El-Nemr, M. A., Elkatory, M. R., Ragab, S., Niculescu, V.-C., & El Nemr, A. J. T. i. C. C. (2023). Principles of photocatalysts and their different applications: a review. *381*(6), 31. doi:<https://doi.org/10.1007/s41061-023-00444-7>
- Hassan, F., Talami, B., Almansba, A., Bonnet, P., Caperaa, C., Dalhatou, S., Zeghioud, H. (2024). Photocatalytic Degradation of Tartrazine and Naphthol Blue Black Binary Mixture with the TiO<sub>2</sub> Nanosphere under Visible Light: Box-Behnken Experimental Design Optimization and Salt

- Effect. *ChemEngineering*, 8(3).  
doi:<https://doi.org/10.3390/chemengineering8030050>
- Hirao, N., & Ohishi, Y. J. R. o. S. I. (2022). X-ray focusing to 62 keV by compound refractive lenses for high-pressure x-ray diffraction. 93(8).  
doi:<https://doi.org/10.1063/5.0099652>
- Ibarra-Rodriguez, L. I., Alfaro Cruz, M. R., Garay-Rodriguez, L. F., Hernandez-Majalca, B. C., Domínguez-Arvizu, J. L., López-Ortiz, A., Collins-Martínez, V. H. (2023). Photocatalytic reduction of CO<sub>2</sub> over Ni-Cu<sub>x</sub>O thin films towards formic acid production. *Journal of Materials Research and Technology*, 26, 137-149. doi:<https://doi.org/10.1016/j.jmrt.2023.07.118>
- Jabur, A. S., & Ahmed, A. D. (2020). Preparation and Evaluation of CuO Nanoparticles Using the Sol-Gel Method. *IOP Conference Series: Materials Science and Engineering*, 987(1), 012026.  
doi:<https://doi.org/10.1088/1757-899X/987/1/012026>
- Jiříčková, A., Jankovský, O., Sofer, Z., & Sedmidubský, D. J. M. (2022). Synthesis and applications of graphene oxide. 15(3), 920.  
doi:<https://doi.org/10.3390/ma15030920>
- Jorgetto, A. O., Boldrin Zanoni, M. V., & Orlandi, M. O. (2023). Assessment of the superior photocatalytic properties of Sn(2+)-containing SnO(2) microrods on the photodegradation of methyl orange. *Sci Rep*, 13(1), 14774.  
doi:<https://doi.org/10.1038/s41598-023-40659-8>
- Jubu, P. R., Obaseki, O., Ajayi, D., Danladi, E., Chahrour, K. M., Muhammad, A., . . . Yam, F. J. J. o. O. (2024). Considerations about the determination of optical bandgap from diffuse reflectance spectroscopy using the Tauc plot. 53(5), 5054-5064. doi:<https://doi.org/10.1007/s12596-024-01741-0>
- Kanchana, T., Sivakumar, T., & Venkateswari, P. J. J. o. M. S. (2022). Enhanced photocatalytic properties of ZnS/CdS/ZnCdS catalysts under visible light irradiation. 1265, 133375.  
doi:<https://doi.org/10.1016/j.molstruc.2022.133375>
- Kanwal, F., Javed, T., Hussain, F., Wasim, M., & Batool, M. (2024). Enhanced dye photodegradation through ZnO and ZnO-based photocatalysts doped with selective transition metals: a review. *Environmental Technology Reviews*, 13(1), 754-793. doi:<https://doi.org/10.1080/21622515.2024.2426725>
- Karmaoui, M., Jorge, A. B., McMillan, P. F., Aliev, A. E., Pullar, R. C., Labrincha, J. A., & Tobaldi, D. M. (2018). One-Step Synthesis, Structure, and Band Gap Properties of SnO(2) Nanoparticles Made by a Low Temperature Nonaqueous Sol-Gel Technique. *ACS Omega*, 3(10), 13227-13238.  
doi:<https://doi.org/10.1021/acsomega.8b02122>
- Kathing, C., & Saini, G. J. R. P. i. M. (2022). A review of various treatment methods for the removal of dyes from textile effluent. 4(4), 1-15.  
doi:<https://doi.org/10.21926/rpm.2204028>
- Keabadile, O. P., Aremu, A. O., Elugoke, S. E., & Fayemi, O. E. (2020). Green and Traditional Synthesis of Copper Oxide Nanoparticles-Comparative Study. *Nanomaterials (Basel)*, 10(12). doi:<https://doi.org/10.3390/nano10122502>
- Khalid, N. R., Tahir, M. B., Majid, A., Ahmed, E., Ahmad, M., Khalid, S., & Ahmed, W. (2024). TiO<sub>2</sub>-Graphene-Based Composites: Synthesis,

- Characterization, and Application in Photocatalysis of Organic Pollutants. In *Micro and Nanomanufacturing Volume II, Second Edition 2025* (Vol. II, pp. 91-117).doi:[https://doi.org/10.1007/978-3-031-70499-4\\_4](https://doi.org/10.1007/978-3-031-70499-4_4)
- Khan, S., Noor, T., Iqbal, N., & Yaqoob, L. J. A. o. (2024). Photocatalytic dye degradation from textile wastewater: a review. *9*(20), 21751-21767. doi:<https://doi.org/10.1021/acsomega.4c00887>
- Klein, J., Kampermann, L., Mockenhaupt, B., Behrens, M., Strunk, J., & Bacher, G. J. A. F. M. (2023). Limitations of the Tauc plot method. *33*(47), 2304523. doi:<https://doi.org/10.1002/adfm.202304523>
- Koohestani, H. (2019). Photocatalytic performance of rod-shaped copper oxides prepared by spin coating. *Micro and Nano Letters*, *14*(3), 339-343. doi:<https://doi.org/10.1049/mnl.2018.5447>
- Kumar, V. (2020). Ultrasonic-assisted de-agglomeration and power draw characterization of silica nanoparticles. *Ultrasonics Sonochemistry*, *65*. doi:<https://doi.org/10.1016/j.ultsonch.2020.105061>
- Kumari, H., Sonia, Suman, Ranga, R., Chahal, S., Devi, S., Parmar, R. (2023). A Review on Photocatalysis Used For Wastewater Treatment: Dye Degradation. *Water Air Soil Pollut*, *234*(6), 349. doi:<https://doi.org/10.1007/s11270-023-06359-9>
- Kurajica, S., Mandić, V., Tkalčević, M., Mužina, K., & Munda, I. K. J. K. u. i. Č. k. i. k. i. H. (2019). Measurement and Control: Determination of the Semiconductors Band Gap by UV-Vis Diffuse Reflectance Spectroscopy. *68*(9-10 (special issue)), 415-426. doi:<https://doi.org/10.15255/KUI.2019.044>
- Kusumawardani, L. J., Syahputri, Y., & Fathurrahman, M. (2025). TiO<sub>2</sub>/Zeolite Coal Fly Ash Nanocomposite for Photodegradation of Naphthol Blue Black Dye: Optimization and Mechanism under Visible Light. *Jurnal Kimia Valensi*, *11*(1), 92-104. doi:<https://doi.org/10.15408/jkv.v11i1.45036>
- Lavagna, L., Nisticò, R., Musso, S., & Pavese, M. (2021). Functionalization as a way to enhance dispersion of carbon nanotubes in matrices: a review. *Materials Today Chemistry*, *20*. doi:<https://doi.org/10.1016/j.mtchem.2021.100477>
- Lee, K. H., Arfa, U., Arshad, Z., Lee, E.-J., Alshareef, M., Alsowayigh, M. M., Hamad, N. J. C. (2023). The comparison of metal doped TiO<sub>2</sub> photocatalytic active fabrics under sunlight for waste water treatment applications. *13*(9), 1293. doi:<https://doi.org/10.3390/catal13091293>
- Li, J., Wang, X., Yu, J., Wang, H., & Wang, X. (2022). Facile Synthesis of Carbon Dots from Amido Black 10b for Sensing in Real Samples. *ACS Omega*, *7*(50), 47002-47008. doi:<https://doi.org/10.1021/acsomega.2c06047>
- Liu, F., Fan, F., Lü, Y., Zhang, S., & Zhao, C. (2016). Research progress on photocatalytic degradation of organic pollutants by graphene/TiO<sub>2</sub> composite materials. *Huagong Xuebao/CIESC Journal*, *67*(5), 1635-1643. doi:<https://doi.org/10.11949/j.issn.0438-1157.20151581>
- Liu, N., Zhao, S., Song, R., Zhou, L., Wang, B., Huang, D., Jiang, T. (2024). Fourier transform infrared spectrometer based on graphene photodetection.

- Hongwai yu Jiguang Gongcheng/Infrared and Laser Engineering*, 53(11). doi:<https://doi.org/10.3788/IRLA20240352>
- Liu, R., Zhu, X., & Chen, B. (2017). A New Insight of Graphene oxide-Fe(III) Complex Photochemical Behaviors under Visible Light Irradiation. *Sci Rep*, 7, 40711. doi:<https://doi.org/10.1038/srep40711>
- Lu, K.-Q., Li, Y.-H., Tang, Z.-R., & Xu, Y.-J. J. A. M. A. (2021). Roles of graphene oxide in heterogeneous photocatalysis. *1*(1), 37-54. doi:<https://doi.org/10.1021/acsmaterialsau.1c00022>
- Makula, P., Pacia, M., & Macyk, W. (2018). How To Correctly Determine the Band Gap Energy of Modified Semiconductor Photocatalysts Based on UV-Vis Spectra. *Journal of Physical Chemistry Letters*, 9(23), 6814-6817. doi:<https://doi.org/10.1021/acs.jpcllett.8b02892>
- Mandal, S., Mallapur, S., Reddy, M., Singh, J. K., Lee, D. E., & Park, T. (2020). An Overview on Graphene-Metal Oxide Semiconductor Nanocomposite: A Promising Platform for Visible Light Photocatalytic Activity for the Treatment of Various Pollutants in Aqueous Medium. *Molecules*, 25(22). doi:<https://doi.org/10.3390/molecules25225380>
- Mandru, A., Mane, J., Mandapati, R. J. J. o. P. I., & Research. (2023). A Review on UV-visible spectroscopy. *1*(2), 091-096. doi:<https://doi.org/10.5281/zenodo.10232708>
- Mayerhöfer, T. G., Pahlow, S., & Popp, J. (2020). The Bouguer-Beer-Lambert Law: Shining Light on the Obscure. *Chemphyschem*, 21(18), 2029-2046. doi:<https://doi.org/10.1002/cphc.202000464>
- Mishra, A. K., Nayak, A. K., Das, A. K., & Pradhan, D. J. T. J. o. P. C. C. (2018). Microwave-assisted solvothermal synthesis of cupric oxide nanostructures for high-performance supercapacitor. *122*(21), 11249-11261. doi:<https://pubs.acs.org/doi/abs/10.1021/acs.jpcc.8b02210>
- Mohamadpour, F., & Amani, A. M. J. R. a. (2024). Photocatalytic systems: reactions, mechanism, and applications. *14*(29), 20609-20645. doi:<https://doi.org/10.1039/D4RA03259D>
- Mohamed, M. A., Hir, Z. A. M., Mokthar, W. N. A. W., & Osman, N. S. (2020). Features of metal oxide colloidal nanocrystal characterization. In *Colloidal Metal Oxide Nanoparticles* (pp. 83-122): Elsevier. doi:<https://doi.org/10.1016/B978-0-12-813357-6.00008-5>
- Mohtar, S. S., Aziz, F., Ismail, A. F., Sambudi, N. S., Abdullah, H., Rosli, A. N., & Ohtani, B. J. C. (2021). Impact of doping and additive applications on photocatalyst textural properties in removing organic pollutants: a review. *11*(10), 1160. doi:<https://doi.org/10.3390/catal11101160>
- Mushahary, N., Sarkar, A., Basumatary, F., Brahma, S., Das, B., & Basumatary, S. (2024). Recent developments on graphene oxide and its composite materials: From fundamentals to applications in biodiesel synthesis, adsorption, photocatalysis, supercapacitors, sensors and antimicrobial activity. *Results in Surfaces and Interfaces*, 15. doi:<https://doi.org/10.1016/j.rsurfi.2024.100225>

- Mustafa, S. A., Al-Rudainy, A. J., & Salman, N. M. (2024). Effect of environmental pollutants on fish health: An overview. *Egyptian Journal of Aquatic Research*, 50(2), 225-233. doi:<https://doi.org/10.1016/j.ejar.2024.02.006>
- Nahar, B., Chaity, S. B., Gafur, M. A., & Hossain, M. Z. J. J. o. N. (2023). Synthesis of spherical copper oxide nanoparticles by chemical precipitation method and investigation of their photocatalytic and antibacterial activities. 2023(1), 2892081. doi:<https://doi.org/10.1155/2023/2892081>
- Nakai, I., Li, Y., & Kurisu, M. J. J. o. t. P. S. o. J. (2023). Local Distortion in CuO Controlled by Transition Metal Doping. 92(10), 104602. doi:<https://doi.org/10.7566/JPSJ.92.104602>
- Navas-Pinto, W., Cree, D. E., Wilson, L. D., Barrionuevo, G. O., Sánchez-Sánchez, X., & Calvopiña, H. (2025). Characterization of graphene oxide synthesized through a modified Hummers method. *Ingenius*, 2025(34), 31-42. doi:<https://doi.org/10.17163/ings.n34.2025.03>
- Németh, G., Bechtel, H. A., & Borondics, F. (2024). Origins and consequences of asymmetric nano-FTIR interferograms. *Optics Express*, 32(9), 15280-15294. doi:<https://doi.org/10.1364/OE.520793>
- Olatunde, O. C., & Onwudiwe, D. C. (2022). A comparative study of the effect of graphene oxide, graphitic carbon nitride, and their composite on the photocatalytic activity of  $\text{Cu}_3\text{SnS}_4$ . *Catalysts*, 12(1). doi:<https://doi.org/10.3390/catal12010014>
- Passos, M. L. C., Sarraguça, M. C., & Saraiva, M. L. M. F. S. (2019). Spectrophotometry | organic compounds. In *Encyclopedia of Analytical Science* (pp. 236-243). doi:<https://doi.org/10.1016/B978-0-12-409547-2.14465-8>
- Pawar, S. M., Patil, S. S., Sonawane, K. D., More, V. B., Patil, P. S. J. S., & Interfaces. (2024). Hydrothermally synthesized copper oxide nanoparticles: Rietveld analysis and antimicrobial studies. 51, 104598. doi:<https://doi.org/10.1016/j.surfin.2024.104598>
- Perini, J. A. L., Tonetti, A. L., Vidal, C., Montagner, C. C., & Nogueira, R. F. P. J. A. C. B. E. (2018). Simultaneous degradation of ciprofloxacin, amoxicillin, sulfathiazole and sulfamethazine, and disinfection of hospital effluent after biological treatment via photo-Fenton process under ultraviolet germicidal irradiation. 224, 761-771. doi:<https://doi.org/10.1016/j.apcatb.2017.11.021>
- Periyasamy, A. P. J. S. (2024). Recent advances in the remediation of textile-dye-containing wastewater: prioritizing human health and sustainable wastewater treatment. 16(2), 495. doi:<https://doi.org/10.3390/su16020495>
- Phiwdang, K., Suphankij, S., Mekprasart, W., & Pecharapa, W. J. E. p. (2013). Synthesis of CuO nanoparticles by precipitation method using different precursors. 34, 740-745. doi:<https://doi.org/10.1016/j.egypro.2013.06.808>
- Piątkowska, A., Janus, M., Szymański, K., & Mozia, S. J. C. (2021). C-, N- and S-doped TiO<sub>2</sub> photocatalysts: a review. 11(1), 144. doi:<https://doi.org/10.3390/catal11010144>
- Potbhare, A. K., Aziz, S. K. T., Ayyub, M. M., Kahate, A., Madankar, R., Wankar, S., Chaudhary, R. G. (2024). Bioinspired graphene-based metal oxide nanocomposites for photocatalytic and electrochemical performances: an

- updated review. *Nanoscale Adv*, 6(10), 2539-2568. doi:<https://doi.org/10.1039/d3na01071f>
- Potbhare, A. K., Aziz, S. T., Ayyub, M. M., Kahate, A., Madankar, R., Wankar, S., Adhikari, R. J. N. A. (2024). Bioinspired graphene-based metal oxide nanocomposites for photocatalytic and electrochemical performances: an updated review. 6(10), 2539-2568. doi:<https://doi.org/10.1039/D3NA01071F>
- Quadri, T. W., Fayemi, O. E., Olasunkanmi, L. O., & Ebenso, E. E. (2023). Survey of different electrochemical and analytical techniques for corrosion measurements. In *Electrochemical and Analytical Techniques for Sustainable Corrosion Monitoring: Advances, Challenges and Opportunities* (pp. 293-323).doi:<https://doi.org/10.1016/B978-0-443-15783-7.00012-8>
- Rajoria, B., & Roy, A. (2022). Bacterial and fungal degradation of dyes: A remedial source. In *Development in Wastewater Treatment Research and Processes: Microbial Degradation of Xenobiotics through Bacterial and Fungal Approach* (pp. 23-43).doi:<https://doi.org/10.1016/B978-0-323-85839-7.00019-0>
- Rambabu, Y., Kumar, U., Singhal, N., Kaushal, M., Jaiswal, M., Jain, S. L., & Roy, S. C. (2019). Photocatalytic reduction of carbon dioxide using graphene oxide wrapped TiO<sub>2</sub> nanotubes. *Applied Surface Science*, 485, 48-55. doi:<https://doi.org/10.1016/j.apsusc.2019.04.041>
- Reshma, R., Abishek, N., & Gopalakrishna, K. N. J. I. C. C. (2024). Synthesis and characterization of graphene oxide, tin oxide, and reduced graphene oxide-tin oxide nanocomposites. 165, 112451. doi:<https://doi.org/10.1016/j.inoche.2024.112451>
- Rocha, F. S., Gomes, A. J., Lunardi, C. N., Kaliaguine, S., & Patience, G. S. J. T. C. J. o. C. E. (2018). Experimental methods in chemical engineering: Ultraviolet visible spectroscopy—UV-Vis. 96(12), 2512-2517. doi:<https://doi.org/10.1002/cjce.23344>
- Saeed, M., Muneer, M., Haq, A. u., Akram, N. J. E. S., & Research, P. (2022). Photocatalysis: an effective tool for photodegradation of dyes—a review. 29(1), 293-311. doi:<https://doi.org/10.1007/s11356-021-16389-7>
- Saha, H., Dastider, A., Anik, M. J. F., Mim, S. R., Talapatra, S., Das, U., Billah, M. M. J. R. i. M. (2024). Photocatalytic performance of CuO NPs: An experimental approach for process parameter optimization for Rh B dye. 24, 100614. doi:<https://doi.org/10.1016/j.rinma.2024.100614>
- Saleem, M. H., Ejaz, U., Vithanage, M., Bolan, N., Siddique, K. H. J. C. T., & Policy, E. (2024). Synthesis, characterization, and advanced sustainable applications of copper oxide nanoparticles: a review. 1-26. doi:<https://doi.org/10.1007/s10098-024-02774-6>
- Sapkota, K. P., Lee, I., Hanif, M. A., Islam, M. A., Akter, J., & Hahn, J. R. J. C. (2020). Enhanced visible-light photocatalysis of nanocomposites of copper oxide and single-walled carbon nanotubes for the degradation of methylene blue. 10(3), 297. doi:<https://doi.org/10.3390/catal10030297>

- Sen, P., Bhattacharya, P., Mukherjee, G., Ganguly, J., Marik, B., Thapliyal, D., Arya, R. K. J. T. (2023). Advancements in doping strategies for enhanced photocatalysts and adsorbents in environmental remediation. *11*(5), 144. doi:<https://doi.org/10.3390/technologies11050144>
- Shah, Z., Arshad, T., Shaheen, K., Khan, S. B., Salman, S. M., & Uddin, A. L. A. (2021). Recent and future prospective of various photo-catalysts for environmental pollution and energy production: A review. *Surface Review and Letters*, *28*(9). doi:<https://doi.org/10.1142/S0218625X21300021>
- Silver, J., Lubis, S., & Ramli, M. J. J. K. S. D. A. (2023). Green synthesis, characterization, and photocatalytic activity of zinc oxide nanoparticles on photodegradation of naphthol blue black dye. *26*(9), 363-371. doi:<https://doi.org/10.14710/jksa.26.9.363-371>
- Singh, G. B., Vinayak, A., Mudgal, G., & Kesari, K. K. (2024). Azo dye bioremediation: An interdisciplinary path to sustainable fashion. *Environmental Technology and Innovation*, *36*. doi:<https://doi.org/10.1016/j.eti.2024.103832>
- Singh, J. P., Sharma, Y. K., Nag, A., Pal, S., Goyal, P., & Gangwar, A. K. J. J. o. O. (2024). Optical and electronic characterization of CdS: Nd<sup>3+</sup> nanoparticles using diffuse reflectance spectroscopy techniques. 1-7. doi:<https://doi.org/10.1007/s12596-024-02159-4>
- Singha, K., Pandit, P., Maity, S., & Sharma, S. R. (2021). Harmful environmental effects for textile chemical dyeing practice. In *Green Chemistry for Sustainable Textiles: Modern Design and Approaches* (pp. 153-164). doi:<https://doi.org/10.1016/B978-0-323-85204-3.00005-1>
- Siyalo, S., Etefa, H. F., & Dejene, F. B. J. C. P. I. (2025). Enhancing structural and optical properties of CuO thin films through gallium doping: A pathway to enhanced photoluminescence and predict for solar cells applications. *10*, 100832. doi:<https://doi.org/10.1016/j.chphi.2025.100832>
- Solís-Oviedo, R. L., & Pech-Canul, Á. D. L. C. (2019). *Frontiers and New trends in the science of fermented food and beverages: BoD–Books on Demand*. doi:<https://doi.org/10.5772/intechopen.73404>
- Strebel, A., Behringer, M., Hilbig, H., Machner, A., & Helmreich, B. J. F. i. E. E. (2024). Anionic azo dyes and their removal from textile wastewater through adsorption by various adsorbents: a critical review. *3*, 1347981. doi:<https://doi.org/10.3389/fenve.2024.1347981>
- Tahir, M. B., Sohaib, M., Sagir, M., & Rafique, M. J. E. o. s. m. (2021). Role of nanotechnology in photocatalysis. *578*. doi:<https://doi.org/10.1016/B978-0-12-815732-9.00006-1>
- Tang, B., & Zhang, F. (2025). Fourier Transform Infrared Spectroscopy. In *Energy Storage Materials Characterization: Determining Properties and Performance: Volume 1-2* (Vol. 1-2, pp. 419-446). doi:<https://doi.org/10.1002/9783527834679.ch17>
- Tran, P. D., Batabyal, S. K., Pramana, S. S., Barber, J., Wong, L. H., & Loo, S. C. J. (2012). A cuprous oxide-reduced graphene oxide (Cu<sub>2</sub>O-rGO) composite photocatalyst for hydrogen generation: Employing rGO as an electron

- acceptor to enhance the photocatalytic activity and stability of Cu<sub>2</sub>O. *Nanoscale*, 4(13), 3875-3878. doi:<https://doi.org/10.1039/c2nr30881a>
- Ucar, N., Yuksek, I. O., Olmez, M., Can, E., & Onen, A. (2019). The effect of oxidation process on graphene oxide fiber properties. *Materials Science-Poland*, 37(1), 83-89. doi:<https://doi.org/10.2478/msp-2019-0015>
- Utami, M., Wang, S., Musawwa, M. M., Fitri, M., Wijaya, K., Johnravindar, D., jin Chung, W. J. C. (2023). Photocatalytic degradation of naphthol blue from Batik wastewater using functionalized TiO<sub>2</sub>-based composites. 337, 139224. doi:<https://doi.org/10.1016/j.chemosphere.2023.139224>
- Vekhande, H. N., & Bagawade, J. A. (2025). Synthesis and characterization of graphene oxide using a modified Hummers method for enhanced quality and yield. *Fullerenes Nanotubes and Carbon Nanostructures*. doi:<https://doi.org/10.1080/1536383X.2025.2530136>
- Verma, S., & Dutta, R. K. J. R. a. (2015). A facile method of synthesizing ammonia modified graphene oxide for efficient removal of uranyl ions from aqueous medium. 5(94), 77192-77203. doi:<https://doi.org/10.1039/C5RA10555B>
- Vinesh, V., Shaheer, A. R. M., & Neppoliana, B. (2021). Nanostructuring of Hybrid Materials Using Wrapping Approach to Enhance the Efficiency of Visible Light-Responsive Semiconductor Photocatalyst. In *Nanostructured Materials for Environmental Applications* (pp. 223-238). doi:[https://doi.org/10.1007/978-3-030-72076-6\\_8](https://doi.org/10.1007/978-3-030-72076-6_8)
- Wang, Y., Lany, S., Ghanbaja, J., Fagot-Revurat, Y., Chen, Y. P., Soldera, F., Pierson, J.-F. J. P. R. B. (2016). Electronic structures of Cu<sub>2</sub>O, Cu<sub>4</sub>O<sub>3</sub>, and CuO: A joint experimental and theoretical study. 94(24), 245418. doi:<https://doi.org/10.1103/PhysRevB.94.245418>
- Wani, K. A., Jangid, N. K., & Bhat, A. R. (2019). *Impact of textile dyes on public health and the environment*: IGI Global. doi:<https://doi.org/10.4018/978-1-7998-0311-9>
- Wathudura, P., Pham, H., Siriwardana, K., Athukorale, S., Jayasundara, U., Gunatilake, S. R., Zhang, D. (2025). Expanding the Horizons of UV-vis Spectroscopy Education: Beyond the Beer-Lambert Law. *Journal of Chemical Education*, 102(6), 2389-2397. doi:<https://doi.org/10.1021/acs.jchemed.5c00255>
- Welegergs, G., Akoba, R., Sacky, J., & Nuru, Z. J. M. T. P. (2021). Structural and optical properties of copper oxide (CuO) nanocoatings as selective solar absorber. 36, 509-513. doi:<https://doi.org/10.1016/j.matpr.2020.05.298>
- Yaemsunthorn, K., Macyk, W., & Ortyl, J. J. P. i. P. S. (2024). Semiconductor photocatalysts in photopolymerization processes: Mechanistic insights, recent advances, and future prospects. 158, 101891. doi:<https://doi.org/10.1016/j.progpolymsci.2024.101891>
- Yang, Z., Sun, Y., Hou, Z., Yu, H., Li, M., Li, Y., Xu, S. J. J. o. H. M. (2023). Repeated fluctuation of Cu<sup>2+</sup> concentration during photocatalytic purification of SMZ-Cu<sup>2+</sup> combined pollution: Behavior, mechanism and application. 447, 130768. doi:<https://doi.org/10.1016/j.jhazmat.2023.130768>

- Yitagesu, G. B., Leku, D. T., Seyume, A. M., & Workneh, G. A. (2024). Biosynthesis of TiO<sub>2</sub>/CuO and Its Application for the Photocatalytic Removal of the Methylene Blue Dye. *ACS Omega*, 9(40), 41301-41313. doi:<https://doi.org/10.1021/acsomega.4c03472>
- Yoon, Y., Truong, P. L., Lee, D., & Ko, S. H. J. A. N. A. (2021). Metal-oxide nanomaterials synthesis and applications in flexible and wearable sensors. 2(2), 64-92. doi:<https://doi.org/10.1021/acsnanoscienceau.1c00029>
- Zhang, B., Sun, B., Liu, F., Gao, T., & Zhou, G. (2024). TiO<sub>2</sub>-based S-scheme photocatalysts for solar energy conversion and environmental remediation. *Science China Materials*, 67(2), 424-443. doi:<https://doi.org/10.1007/s40843-023-2754-8>
- Zhou, K., Zhu, Y., Yang, X., Jiang, X., & Li, C. (2011). Preparation of graphene-TiO<sub>2</sub> composites with enhanced photocatalytic activity. *New Journal of Chemistry*, 35(2), 353-359. doi:<https://doi.org/10.1039/c0nj00623h>