

DAFTAR PUSTAKA



- Adnan, I., Adugna, A. T., dan Alemayehu, E., 2021. Textile Industry Effluent Treatment Techniques. *Journal of Chemistry*, 2(1), 1-14. doi: 10.1155/2021/5314404
- Afandy, M. A., dan Sawali, F. D. I., 2024. Studi Isotherm Adsorpsi Cu (II) dalam Larutan Menggunakan Zeolit Teraktivasi. *Jurnal Teknologi Kimia Mineral*, 3(1), 25-32. doi: 10.61844/jtkm.v3i1.755
- Ahmad, A., Khan, N., Giri, B. S., Chowdhary, P., dan Chaturvedi, P., 2020. Removal of Methylene Blue Dye using Rice Husk, Cow Dung and Sludge Biochar: Characterization, Application, and Kinetic Studies. *Bioresource Technology*, 306(1), 1-12. doi: 10.1016/j.biortech.2020.12320
- Akram, B., Umar, A., Ali, M.A., 2024. Kinetic and Thermodynamic Analysis of Alizarin Red S Biosorption by Alhagi maurorum: A Sustainable Approach for Water Treatment. *BMC Biotechnol*, 24(85), 132-145. doi: 10.1186/s12896-024-00913-x
- Akter, M., Rahman, F. B. A., Abedin, M. Z., dan Kabir, S. M. F., 2021. Adsorption Characteristics of Banana Peel in the Removal of Dyes from Textile Effluent Textiles, 1(2), 361-375. doi: 10.3390/textiles1020018
- Al Jaber, F. Y., 2024. Extensive Study of Electrocoagulation-Based Adsorption Process of Real Groundwater Treatment: Isotherm Modeling, Adsorption Kinetics, and Thermodynamics. *Water*, 16(4), 619-622. doi: 10.3390/w16040619
- Aldalbahi, A., El-Naggar, M. E., El-Newehy, M. H., Rahaman, M., Hatshan, M. R., dan Khattab, T. A., 2021. Effects of Technical Textiles and Synthetic Nanofibers on Environmental Pollution. *Polymers*, 13(1), 155-162. doi: 10.3390/polym13010155
- Alhassan, S. I., Huang, L., He, Y., Yan, L., Wu, B., dan Wang, H., 2021. Fluoride Removal from Water Using Alumina and Aluminum-Based Composites: A Comprehensive Review of Progress. *Critical Reviews in Environmental Science and Technology*, 51(18), 2051-2085. doi: 10.1080/10643389.2020.1769441
- Ali, A. N. 2023. A Comprehensive Study of Natural and Synthetic Dyes: Their Properties, Methods of Preparation and Uses. *SHIFAA*, 24(1). doi: 10.70470/SHIFAA/2024/001
- Ali, N., Ahmad, S., Khan, A., Khan, S., Bilal, M., Ud Din, S., dan Khan, H., 2020. Selenide Chitosan as High-Performance Nanophotocatalyst for Accelerated Degradation Of Pollutants. *Chemistry An Asian Journal*, 15(17), 2660-2673. doi: 10.1002/asia.202000597
- Al-Salihi, K.J. dan Alfatlawi, W.R., 2021. Synthesis and Characterization of Low-Cost Adsorbent and Used for Alizarin Yellow GG and Alizarin Red S Dyes Removal



Aqueous Solutions. IOP Conference Series: Materials Science and Engineering, 1094(012175), 1-11. doi: 10.1088/1757-899X/1094/1/012175

J., Grmasha, R. A., Meiczinger, M., Al-Juboori, R. A., Somogyi, V., dan Al-Hajim, K. S., 2024, A Sustainable Banana Peel Activated Carbon for Removing Pharmaceutical Pollutants from Different Waters: Production, Characterization, and Application. *Materials*, 17(5), 1032-1042. doi: 10.3390/ma17051032

Amala, W. N., dan Winarsih, W., 2024. Potensi Kulit Pisang Kepok dan Sabut Kelapa sebagai Biosorben Logam Berat Pb di Air. *LenteraBio: Berkala Ilmiah Biologi*, 13(3), 368-376. doi: 10.26740/lenterabio.v13n3.p%20368-376

Amna, S., Shahab, A., dan Maryana, M., 2024. Sintesis Karbon Aktif dari Batang Kelapa Sawit Menggunakan Aktivator Asam Fosfat (H_3PO_4). *Jurnal Teknik Patra Akademika*, 15(1), 44-54. doi: 10.52506/jtpa.v15i01.242

Anhar, Y., Halim, A., dan Husna, R., 2023. Pengaruh Jenis Media Tanam dan Konsentrasi Pupuk Organik Cair dari Limbah Kulit Pisang terhadap Pertumbuhan dan Hasil Tanaman Selada (*Lactuca Sativa L.*). *Jurnal Ilmiah Mahasiswa Pertanian*, 8(2), 8-17. doi: 10.17969/jimfp.v8i2.24147

Anwar, N. A. F., Meicahayanti, I., dan Rahayu, D. E., 2022. Pengaruh Variasi Waktu Kontak dan Massa Adsorben Kulit Jeruk Siam (*Citrus Nobilis*) terhadap Penyisihan Kadmium (Cd) dan Merkuri (Hg). *Jurnal Teknologi Lingkungan UNMUL*, 6(1), 35-43. doi: 10.30872/jtlunmul.v6i1.7409

Ardila, L. D., Poutou-Piñales, R. A., Pedroza-Rodríguez, A. M., dan Quevedo-Hidalgo, B. E. 2021. A Brief History of Colour, The Environmental Impact of Synthetic Dyes and Removal by Using Laccases. *Molecules*, 26(13), 3813-3822. doi: 10.3390/molecules26133813

Ariguna, I. W. S. P., Wiratini, N. M., dan Sastrawidana, I. D. K., 2020. Degradasi Zat Warna Remazol Yellow FG dan Limbah Tekstil Buatan dengan Teknik Elektrooksidasi. *Jurnal Pendidikan Kimia Undiksha*, 1(1), 127-138. doi: 10.23887/jjpk.v1i1.4447

Astuti, W., Mahardhika, M. A., Putri, D. A., Rohman, M., Sihab, M. F., Sulistyaningsih, T., dan Irchamsyah, E. F., 2023. Application of Kepok Banana Peel Activated Carbon Prepared by Conventional and Microwave Heating for Malachite Green Adsorption. *IOP Conference Series: Materials Science and Engineering*, 625(1), 1-6. doi: 10.1088/1757-899X/625/1/012025

Ayele, A., Getachew, D., Kamaraj, M., dan Suresh, A., 2021. Phycoremediation of Synthetic Dyes: An Effective and Eco-Friendly Algal Technology for The Dye Abatement. *Journal of Chemistry*, 2(1), 1-14. doi: 10.1155/2021/9923643

Bai, T., Yao, Y., Zhao, J., Tian, L., dan Zhang, L., 2024. Adsorption Performance and Mechanism of H_3PO_4 -Modified Banana Peel Hydrothermal Carbon on Pb (II). *Separations*, 11(1), 17-21. doi: 10.3390/separations1101001b



Sharali, D. K., dan Morris, M. A., 2022. Lignocellulosic Based Activated Carbon Prepared by A Chemical Impregnation Method as Electrode Materials for Double Layer Capacitor. *Advances in Chemical Engineering and Science*, 7(2), 187-190. doi: 10.4236/aces.2017.72013

Brazesh, B., Mousavi, S. M., Zarei, M., Ghaedi, M., Bahrani, S., dan Hashemi, S. A., 2021. Biosorption. In *Interface Science and Technology*, 33(1), 587-682. doi: 10.1016/B978-0-12-818805-7.00003-5

Cao, J., Sangandayo, E., Liu, W., Zhang, W., Liu Y., 2023. Decolorization and Detoxification of Direct Blue 2B by Indigenous Bacterial Consortium. *Journal of Environmental Management*, 242(1), 229-237, doi: 10.1016/j.jenvman.2019.04.067.

Chafidz, A., dan Lestari, A. Y. D., 2021. Pengenalan Teknologi Ekstraksi Zat Warna Alam Untuk Pewarna Alami Batik Di UKM Batik Tulis Kebon Indah Bayat, Klaten. *Jurnal Komunitas: Jurnal Pengabdian Kepada Masyarakat*, 3(2), 101-108. doi: 10.31334/jks.v3i2.1271

Chakraborty, R., Asthana, A., Singh, A. K., Jain, B., Susan, A. B. H., 2022. Adsorption of Heavy Metal Ions by Various Low Cost Adsorbents: A Review. *International Journal of Environmental Analytical Chemistry*, 102(2), 342-379. doi: 0.1080/03067319.2020.1722 811

Cordova Estrada AK, Cordova Lozano F, dan Lara Díaz RA., 2021. Thermodynamics and Kinetic Studies for the Adsorption Process of Methyl Orange by Magnetic Activated Carbons. *Air, Soil and Water Research*, 14(1), 132-143. doi:10.1177/11786221211013336

Coria Oriundo, L. L., Battaglini, F., dan Wirth, S. A., 2021. Efficient Decolorization of Recalcitrant Dyes at Neutral/Alkaline pH by A New Bacterial Laccase-Mediator System. *Ecotoxicology and Environmental Safety*, 217(1), 112237-112242. doi: 10.1016/j.ecoenv.2021.112237

Cundari, L., Fanneza, A. L., dan Arisma, N. C., 2023. Characterization of Biosorbent from *Musa Acuminata* Balbisian Peel Using FTIR Spectroscopy and Its Application to Cadmium (Cd) Removal: Effect Of Activator Type, pH, and Biosorbent ratio. *CHEMICA: Jurnal Teknik Kimia*, 9(3), 142-153. doi: 10.26555/chemica.v9i3.23992

De Magalhães, L. F., da Silva, G. R., dan Peres, A. E. C., 2022. Zeolite Application in Wastewater Treatment. *Adsorption Science dan Technology*, 5(2), 4544-4549. doi: 10.1155/2022/4544

Delpiano, G. R., Tocco, D., Medda, L., Magner, E., dan Salis, A., 2021. Adsorption of Malachite Green and Alizarin Red S Dyes using Fe-Btc Metal Organic Framework As Adsorbent. *International Journal of Molecular Sciences*, 22(2), 2-14 doi: 10.3390/ijms22020788



Andondo, C., Gómez, J. M., Miranda, R., dan Rodríguez, A., 2023. Zeolite adsorbents for Selective Removal of Co (II) And Li (I) from Aqueous Solutions. *Water Research*, 15(2), 270-285. doi: 10.3390/w15020270

Li, W., Diao, J. X., dan Sun, Y., 2024. Characterization of Alizarin Red S Binding Sites and Structural Changes on Human Serum Albumin: A Biophysical Study. *Journal of Hazardous Materials*, 186(1), 352-359. doi: 10.1016/j.jhazmat.2010.11.002.

Dwityaningsih, R., Rahayu, T. E. P. S., Handayani, M., dan Nurhilal, M., 2023. Pengaruh Variasi Konsentrasi H_3PO_4 sebagai Zat Aktivator terhadap Karakteristik Karbon Aktif dari Sekam Padi. *Infotekmesin*, 14(1), 98-104. doi: 10.35970/infotekmesin.v14i1.1641

Eka, E., Andro, D., Andreawan, A., Susilawati, U., Al Ahyar, F., Rafryanto, A. F., dan Arramel, A., 2024. Pemanfaatan Limbah Cangkang Telur Ayam Sebagai Adsorben Zat Warna Methyl Blue Dalam Larutan. *Innovative: Journal Of Social Science Research*, 4(1), 3060-3069. doi: 10.31942/inteka.v2i2.1938

Eso, R., 2021. Efek Variasi Konsentrasi Zat Aktivator H_3PO_4 terhadap Morfologi Permukaan dan Gugus Fungsi Karbon Aktif Cangkang Kemiri. *Gravitasi*, 20(1), 19-23. doi: 10.22487/gravitasi.v20i1.15519

Giechaskiel, B., dan Michaël C., 2021. Fourier transform infrared (FTIR) spectroscopy for measurements of vehicle exhaust emissions: A review. *Applied Sciences*, 74(16), doi: 10.3390/app11167416

Gujar, J. P., Gautam, M. K., dan Modhera, B., 2025. Valorization of Banana Peel into Activated Carbon for Efficient And Sustainable Dye Removal in Textile Industry. *Biomass Conversion and Biorefinery*, 15(1), 1-10. doi: 10.1007/s13399-025-06795-z

Hameed, K. S., Muthirulan, P., dan Sundaram, M. M., 2020. Adsorption of Chromotrope Dye onto Activated Carbons Obtained from the Seeds of Various Plants: Equilibrium and Kinetics Studies. *Arabian Journal of Chemistry*, 10(1), S2225-S2233. doi: 10.1016/j.arabjc.2013.07.058

Haryono, H., dan Rostika, A., 2018, Pengolahan Limbah Zat Warna Tekstil Terdispersi dengan Metode Elektroflotasi. *EduChemia: Jurnal Kimia dan Pendidikan*, 3(1), 94-105. doi: 10.30870/educhemia.v3i1.2625

Hendrawan, Y., dan Sutan, S. M., 2020. Pengaruh Variasi Suhu Karbonisasi dan Konsentrasi Aktivator terhadap Karakteristik Karbon Aktif dari Ampas Tebu (*Bagasse*) Menggunakan *Activating Agent* NaCl. *Journal of Tropical Agricultural Engineering and Biosystems*, 5(3), 200-207. doi: 10.1016/S1872-2040(13)60641-6

Hu, S. C., Cheng, J., Wang, W. P., Sun, G. T., Hu, L. L., Zhu, M. Q., dan Huang, X. H., 2021. Structural Changes and Electrochemical Properties of Lacquer Wood Activated Carbon Prepared by Phosphoric Acid-Chemical Activation for



ercapacitor Applications. Renewable Energy, 177(1), 82-94. doi: 10.1016/j.renene.2021.05.113

A., Hathout, A. S., Abdel-Mobdy, Y. E., Rashed, M. M., Abdel Rahim, E. A., Fouzy, A. S. M., 2023. Preparation and Characterization of Activated Carbon From Agricultural Wastes and Their Ability to Remove Chlorpyrifos From Water. Toxicol Reports, 10(1), 146-154. doi: 10.1016/j.toxrep.2023.01.011

Jadhav, A.C., 2021. Treatment of textile wastewater using adsorption and adsorbents. Sustainable Technologies for Textile Wastewater Treatments. Woodhead Publishing, 235–273

Jiang, Y.Y., Wang, K., Zheng, X.C., Yang, X.D., Li, H.H., 2020. Application of Alizarin/Graphene-Chitosan Modified Electrode on Detection of Human Telomere DNA. Chinese Journal of Analytical Chemistry, 41(4), 481–487. doi: 10.1016/S1872-2040(13)60641-6

Khapre, M. A., dan Jugade, R. M., 2020. Hierarchical Approach Towards Adsorptive Removal of Alizarin Red S Dye Using Native Chitosan and its Successively Modified Versions. Water Science and Technology, 82(4), 1-16. doi: 10.2166/wst.2020.37

Kishor, R., Purchase, D., Saratale, G. D., Saratale, R. G., Ferreira, L. F. R., Bilal, M., dan Bharagava, R. N., 2021. Ecotoxicological and Health Concerns of Persistent Coloring Pollutants of Textile Industry Wastewater and Treatment Approaches For Environmental Safety. Journal of Environmental Chemical Engineering, 9(2), 1-18, doi: 10.1016/j.jece.2020.105012

Liu, H., Jin, P., Zhu, F., Nie, L., dan Qiu, H. 2022, A review on the use of ionic liquids in preparation of molecularly imprinted polymers for applications in solid-phase extraction. TrAC Trends in Analytical Chemistry. 134 (116132), 1-51. doi: 10.1016/j.trac.2020.116132

Ma, Y., Li, P., Yang, L., Wu, L., He, L., Gao, F., dan Zhang, Z., 2020. Iron/Zinc and Phosphoric Acid Modified Sludge Biochar as an Efficient Adsorbent for Fluoroquinolones Antibiotics Removal. Ecotoxicology and Environmental Safety, 191(1), 1-9. doi: 10.1016/j.ecoenv.2020.110550

Manurung, M. N., Fikri, A., Murwanto, B., dan Yushananta, P., 2023. Kinerja Beberapa Varian Kulit Pisang Jenis Lokal terhadap Reduksi Besi (Fe) dalam Air. Ruwa Jurai: Jurnal Kesehatan Lingkungan, 17(1), 1-7. doi: 10.26630/rj.v17i1.3707

Maziarka, P., Wurzer, C., Arauzo, P. J., Dieguez-Alonso, A., Mašek, O., dan Ronsse, F. 2021. Do you BET on Routine? The Reliability of N₂ Physisorption for the Quantitative Assessment of Biochar's Surface Area. Chemical Engineering Journal, 418(1), doi: 10.1016/j.cej.2021.129234

Miri, N.S.S. dan Narimo, 2022. Review : Kajian Persamaan Isoterm Langmuir dan Freundlich pada Adsorpsi Logam Berat Fe (II) dengan Zeolit dan Karbon Aktif dari Biomassa. Jurnal Kimia DOI: 10.30870/educemia.v4i2.6119



Jan Shukla, S. P., 2022. Hazardous Consequences of Textile Mill Effluents Soil and Their Remediation Approaches. Cleaner Engineering and Technology, 7(1), 1-10. doi: 10.1016/j.clet.2022.100434

Indrasari, E., Ameri, M., Shams, M., Ghavami, V., dan Bonyadi, Z., 2023. The Biosorption of Alizarin Red S by *Spirulina Platensis*; Process Modelling, Optimisation, Kinetic and Isotherm Studies. International Journal of Environmental Analytical Chemistry, 103(3), 633-647. doi: 10.1080/03067319.2020.1862814

Neme, I., Gonfa, G., dan Masi, C., 2022. Activated Carbon from Biomass Precursors Using Phosphoric Acid: A Review. Heliyon, 8(12), 1-12. doi: 10.1016/j.heliyon.2022.e11940

Nguyen, T. N., Le, P. A., dan Phung, V. B. T., 2022. Facile Green Synthesis of Carbon Quantum Dots and Biomass-Derived Activated Carbon from Banana Peels: Synthesis and Investigation. Biomass Conversion and Biorefinery, 12(7), 130-143. doi: 10.1007/s13399-020-00839-2

Noori, Z., de PR Moreira, I., Bofill, J. M., dan Poater, J. 2024. Adjusting UV-Vis Spectrum of Alizarin by Insertion of Auxochromes. ChemistryOpen, 13(8), 141-152. doi: 10.1002/open.202400030

Nurhidayati, I., Mellisani, B., Puspita, F., dan Putri, F. A. R., 2022. Penentuan Isotherm dan Kinetika Adsorpsi Ion Besi oleh Sedimen Sebagai Adsorben. Warta Akab, 46(1), 23-31. doi: 10.55075/wa.v46i1.98

Pauline, A. L., dan Joseph, K, 2020. Hydrothermal Carbonization of Organic Wastes to Carbonaceous Solid Fuel A Review Of Mechanisms And Process Parameters. Fuel, 279(2), 1-13. doi: /10.1016/j.fuel.2020.118472

Perdani, F. P., Riyanto, C. A., dan Martono, Y., 2021. Karakterisasi Karbon Aktif Kulit Singkong (*Manihot esculenta crantz*) Berdasarkan Variasi Konsentrasi H₃PO₄ dan Lama Waktu Aktivasi. Indonesian Journal of Chemical Analysis (IJCA), 4(2), 72-81. doi: 10.20885/ijca.vol4.iss2.art4.

Qodim, A., 2022. Kinetika Lawsonia Inermis L. Menggunakan Ultrasound-Assisted Extraction dengan Pelarut Air. Jurnal Teknologi Kimia Mineral. 1 (2), 1-5. doi 10.61844/jtkm.v1i2.125

Rabia, A. R., Adam, T., dan Gopinath, S. C., 2023. Process Optimization and Adsorption Isotherms Investigation in The Removal Of Pb²⁺ From Wastewater Using A Nano Activated Alumina Membrane (NAAM). Biomass Conversion and Biorefinery, 13(15), 13621-13632. doi: 10.1007/s13399-022-03037-4

Rashid, R., Shafiq, I., Akhter, P., Iqbal, M. J., & Hussain, M. 2021. A state-of-the-art review on wastewater treatment techniques: the effectiveness of adsorption method. Environmental Science and Pollution Research, 9050-9066. doi: 10.1007/s11356-021-12395-x



Wahyuni, U., dan Zalfiatri, Y., 2024. Konsentrasi Asam Fosfat (H_3PO_4) terhadap Karakteristik Arang Aktif dari Tempurung Buah Nipah, Sagu, 23(1), doi: 10.1007/s42247-024-00782-2

Santhiarsa, I. N., Dwidiani, N. M., dan Santhiarsa, I. N., 2024. Karakterisasi Karbon Aktif Tempurung Kelapa dengan Variasi Konsentrasi Aktivator terhadap Adsorpsi Timbal. Jurnal Ilmiah Teknik Desain Mekanika, 9(3), 993-997. doi: 10.1094/1/012175

Shabrina, A. S., 2024. Adsorpsi Zat Warna Alizarin Red S Menggunakan Karbon Aktif dari Kulit Singkong (*Manihot esculenta*). Skripsi S1. Departemen Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam. Institut Teknologi Sumatera. Indonesia.

Singha, B., 2021. Use of Wastage Biomaterial/Biomass for Wastewater Treatment and Modeling: Mathematical Modeling for Adsorption Processes. IGI Global Scientific Publishing, 6(1), 311-337. doi: 10.1007/s13399-024-05856-z

Supee, A. H., dan Zaini, M. A. A., 2024. Valorization of Hydrolyzed Banana Peel into Activated Carbons for Methylene Blue And Malachite Green Removal Equilibrium and Kinetic Studies. Biomass Conversion and Biorefinery, 5(1), 1-15. doi: 10.1007/s13399-024-05856-z

Theyab, G. A., Emad, A. S. A., dan Mustafa, R. A., 2023. Study of the Factors Affecting the Adsorption Efficiency of Some Chemical Pesticides Activated Carbon at the Nanoscale. Advanced Journal of Chemistry, 5(1), 89-98. doi: 10.33545/26646781.2023.v5.i1b.147

Tolkou, A. K., Tsoutsas, E. K., Kyzas, G. Z., dan Katsoyiannis, I. A., 2024. Sustainable Use of Low-Cost Adsorbents Prepared from Waste Fruit Peels for The Removal of Selected Reactive and Basic Dyes Found in Wastewaters. Environmental Science and Pollution Research, 31(10), 14662-14689. doi: 10.1007/s11356-024-31868-3

Ural, N., 2021. The Significance of Scanning Electron Microscopy (SEM) Analysis On The Microstructure Of Improved Clay: An Overview. Open Geosciences, 13(1), doi: 10.1515/geo-2020-0145

Winata, B. Y., Erliyanti, N. K., Yogaswara, R. R., dan Saputro, E. A., 2020. Pra Perancangan Pabrik Karbon Aktif dari Tempurung Kelapa dengan Proses Aktivasi Kimia pada Kapasitas 20.000 Ton/Tahun. Jurnal Teknik ITS, 9(2), 399-404. doi: 10.12962/j23373539.v9i2.52338

Yakout, S. M., dan El-Deen, G. S., 2023. Characterization of Activated Carbon Prepared by Phosphoric Acid Activation of Olive Stones. Arabian Journal of Chemistry, 9(1), S1155-S1162. doi: 10.1016/j.arabjc.2011.12.002

Yue, M., Hongwei, Xiang, C., Yan, Z., Jiakang, Q., Qiushi, S., Zhiqiang, N., Pengfei, X., Huayi, Y., 2020. A Combined Leaching and Electrochemical Activation Approach to Converting Coal to Capacitive Carbon in Molten Carbonates, Journal of Clean Production, 248(119218), 1-17. doi: 10.1016/j.jclepro.2019.119218



., dan Rohmah, Y. E. M., 2021. Mass Effect of Coconut Shell Derived Activated Carbon on Adsorption of Benzene, Toluene, Ethylbenzene, and Xylene from Motorcycle Emissions. *Jurnal Kimia Sains dan Aplikasi*, 24(4), 120-125. doi: 10.24127/jksa.24.4.120-125.

Zhou, N., Chen, H., Feng, Q., Yao, D., Chen, H., Wang, H., dan Lu, X., 2020. Effect of Phosphoric Acid on the Surface Properties and Pb (II) Adsorption Mechanisms of Hydrochars Prepared from Fresh Banana Peels. *Journal of Cleaner Production*, 165(1), 221-230. doi: 10.1016/j.jclepro.2017.07.111

Zuki, Z., dan Sakai, T., 2020. Degradasi Senyawa Alizarin S Secara Sonolysis dan Fotolisis dengan Penambahan TiO₂ Anatase. *Jurnal Pilar Sains*, 7(1): 31-36. doi: 10.30598/ijcr.2018.5-fen