



## REFERENCES

- Anggoro, W.S., 2016, Pengujian Abu Vulkanik Gunung Kelud Sebagai Adsorben Untuk Menghilangkan Ion Pb(II) Dalam Larutan, *Skripsi*, Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Gadjah Mada, Yogyakarta.
- Akgül, M., Karabakan, A., Acar, O., Yürüm, Y., 2006, Removal of silver (I) from Aqueous Solutions with Clinoptilolite, *Microporous and Mesoporous Materials.*, 94, 99–104.
- Al-Degs, Y.S., Tutunju, M.F., Shawabkeh, R.A., 2000, The Feasibility of Using Diatomite and Mn-Diatomite for Remediation of Pb<sup>2+</sup>, Cu<sup>2+</sup> and Cd<sup>2+</sup> from Water, *Sep. Sci. Technol.*, Vol.35 Page 2299.
- Ali, I., Asim, M., Khan, T.A., 2012, Low Cost Adsorbents for The Removal of Organic Pollutants from Wastewater, *J. Environ. Manag.*, 113, 170-183.
- ATSDR, 1990, Toxicological profile for silver, Atlanta, GA, US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (TP-90-24).
- Balai Teknik Kesehatan Lingkungan Yogyakarta., 1994, Kandungan Kimia Abu Vulkanik Gunung Merapi Akibat Letusan 22 November 1994, Yogyakarta: BTKL Yogyakarta.
- Behbahani, M., Naja, F., Amini, M.M., Sadeghi, O., Bagheri, A., Hassanlou, P.G., 2014, Solid Phase Extraction Using Nanoporous MCM- 41 Modified with 3,4-Dihydroxybenzaldehyde for Simultaneous Preconcentration and Removal of Gold(III), Palladium(II), Copper(II) and Silver(I), *Journal of Industrial and Engineering Chemistry.*, 20 (4), 2248-2255.
- Behnamfard, A., Salarirad, M.M., Veglio, F., 2013, Process Development for Recovery of Copper and Precious Metals from Waste Printed Circuit Boards with Emphasize on Palladium and Gold Leaching and Precipitation, *Waste Management.*, 33 (11), 2354-2363.
- Çoruh, S., Şenel, G., Ergun, O.N., 2010, A Comparison of The Properties of Natural Clinoptilolites and Their Ion-Exchange Capacities for Silver Removal, *Journal of Hazardous Materials.*, 180 (1-3), 486-492.



- Çoruh, S., Eleveli, S., Şenel, G., Ergun, O.N., 2011, Adsorption of Silver from Aqueous Solution onto Fly Ash and Phosphogypsum Using Full Factorial Design, *Environ. Prog. Sustain. Energy.*, 30, 609-619.
- Dabrowski, A., Podkoscielny, P., Hubicki, Z. and Barczak, M., 2005, Adsorption of Phenolic Compounds by Activated Carbon, *Chemosphere.*, pp, 1049-1070.
- Das, D., Das, N., Mathew, L., 2010, Kinetics, equilibrium and thermodynamic studies on biosorption of Ag(I) from aqueous solution by macrofungus *Pleurotus platypus*, *Journal of Hazardous Materials.*, 2010;184(1-3):765-774.
- Djumat, H.D., 2013, Sintesis Nano Silika Gel Dari Abu Gunung Api Merapi dengan Polietilen Glikol P-(1,1,3,3-tetrametilbutil)-fenil eter (Triton X- 100), *Thesis*, UGM, Yogyakarta.
- El-Ghaffar, M.A.A., Mohamed, M.H., Elwakeel, K.Z., 2009, Adsorption of Silver (I) on Synthetic Chelating Polymer Derived from 3-Amino-1, 2, 4-Triazole-5-Thiol and Glutaraldehyde, *Chem. Eng. J.*, 151, 30-38.
- Eren, E., Afsin, B., Onal, Y., 2009, Removal of Lead Ions by Acid Activated and Manganese Oxide-Coated Bentonite, *J. Hazard. Mater.*, Vol 161, 677-685.
- Ghassabzadeh, H., Mohadespour, A., Torab-Mostaedi, M., Zaheri, P., Maragheh, M.G., Taheri, H., 2010, Adsorption of Ag, Cu and Hg from Aqueous Solutions Using Expanded Perlite, *Journal of Hazardous Materials.*, 177 (1-3), 950-955.
- Hamdaoui, O. and Chiha, M., 2006, Removal of Methylene Blue from Aqueous Solutions by Wheat Bran, *Acta Chim.*, 54, 407–418.
- Huo, H., Su, H., Tan, T., 2009, Adsorption of Ag<sup>+</sup> by a Surface Molecular-Imprinted Biosorbent, *Chemical Engineering Journal.*, 150 (1), 139-144.
- Jeon, C., 2017, Adsorption and Recovery of Immobilized Coffee Ground Beads for Silver Ions from Industrial Wastewater, *Journal of Industrial and Engineering Chemistry.*, 53, 261–267.
- Jintakhosol, T. and Nitayaphat, W., 2016, Adsorption of Silver (I) From Aqueous Solution Using Chitosan/Montmorillonite Composite Beads, *Materials Research.*, 19(5), 1114-1121.



- Khraisheh, M.A.M., Al-degs, Y.S., and Mcminn, W.A.M., 2004, Remediation of Wastewater Containing Heavy Metals Using Raw and Modified Diatomite, *Chemical Engineer Journal.*, 99, 177–184.
- Kusumastuti, E., 2012, Pemanfaatan Abu Vulkanik Gunung Merapi Sebagai Geopolimer (suatu polimer anorganik aluminosilikat), *J. MIPA.*, 35(1), 66-76.
- Lasino, Bambang, S., dan Dany, C., 2011, Pemanfaatan Pasir dan Debu Merapi Sebagai Bahan Konstruksi dalam Mendukung Pembangunan Infrastruktur dan Meningkatkan Nilai Guna Lahar Vulkanik, *Prosiding PPI Standardisasi 2010*, 20-36.
- Lestari, D.Y., 2010, Kajian Modifikasi Dan Karakterisasi Zeolit Alam Dari Berbagai Negara, *Prosiding Seminar Nasional Kimia dan Pendidikan*, Tema: “Profesionalisme Peneliti dan Pendidik dalam Riset dan Pembelajaran yang Berkualitas dan Berkarakter”, Universitas Negeri Yogyakarta, 30 Oktober 2010.
- Neto, A.F.A., Vieira, M.G.A. and Da Silva, M.G.C., 2012, Cu(II) Adsorption on Modified Bentonitic Clays: Different Isotherm Behaviors in Static and Dynamic Systems, *Mater. Res.*, 15, 114- 124.
- Ningsih, W.A.C., 2016, Pengaruh Pencucian Abu Vulkanik Gunung Kelud Dengan Menggunakan Larutan Na<sub>2</sub>EDTA Terhadap Kapasitas Adsorpsi Pada Ion Pb(II), *Skripsi*, Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Gadjah Mada, Yogyakarta.
- Nizar, M and Supardi, Z.A.I., 2016, Sintesis SiO<sub>2</sub> Berbahan Dasar Abu Vulkanik Sebagai Adsorben Ion Pb(II), *Jurnal Inovasi Fisika Indonesia (IFI).*, Vol 05, No 1, Hal 28-32.
- Pratama, A.F., 2016, Pengaruh Perlakuan NaOH Terhadap Kemampuan Adsorpsi Abu Vulkanik Gunung Kelud Pada Ion Pb(II), *Skripsi*, Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Gadjah Mada, Yogyakarta.
- Rudzinski, W., and Plazinski, W., 2006, Kinetics of Solute Adsorption at Solid/Solution Interfaces: A Theoretical Development of The Empirical Pseudo-first and Pseudo-Second Order Kinetic Rate Equations, Based on Applying the Statistical Rate Theory of Interfacial Transport, *J. Phys. Chem. B*, 110(33), 16514-16525.
- Rudzinski, W., and Plazinski, W, 2007, Theoretical Description of the Kinetics of Solute Adsorption at Heterogeneous Solid / Solution Interfaces on the Possibility of Distinguishing Between the Diffusional and the Surface Reaction Kinetics Models, *App. Surf. Sci.*, 253, 5827–5840.



- Sami, M and Zaini, H., 2017, Penyisihan Pb(II) Dalam Air Limbah Laboratorium Kimia Sistem Kolom Dengan Bioadsorben Kulit Kacang Tanah, *Jurnal Penelitian dan Pengabdian Masyarakat.*, Vol 5, Hal 8-14.
- San, A., Tüzen, M., 2013, Adsorption of Silver from Aqueous Solution onto Raw Vermiculite and Manganese Oxide-Modified Vermiculite, *Microporous and Mesoporous Materials.*, 170, 155-163.
- Sankaraiah, S., Lee, J.M., Kim, J.H., Choi, S.W., 2008, Preparation and Characterization of Surface-functionalized Polysilsesquioxane Hard Spheres in Aqueous, *Macromolecules.*, 41, 6195-6204.
- Sari, A., Sahinoglu, G., Tuzen, M., 2012, Antimony(III) Adsorption from Aqueous Solution Using Raw Perlite and Mn-Modified Perlite: Equilibrium, Thermodynamic and Kinetic Studies, *Ind. Eng. Chem. Res.*, 51, 6877-6886.
- Siswoyo, E., Firachmatika, A., Kautsar, R.B., 2016, Removal of Cu (II) in Water by Using Adsorbent Based on Volcanic Ash of Mount Kelud in Indonesia, *International Journal of Environmental Science and Development*, Vol. 7, No. 9, 657-660.
- Song, X., Gunawan, P., Jiang, R., Leong, S.S.J., Wang, K., Xu, R., 2011, Surface Activated Carbon Nanospheres for Fast Adsorption of Silver Ions from Aqueous Solutions, *Journal of Hazardous Materials.*, 194, 162-168.
- Sudaryo dan Sutjipto, 2009, Identifikasi dan Penentuan Logam pada Tanah Vulkanik di Daerah Cangkringan Kabupaten Sleman dengan Metode Analisis Aktivasi Neutron Cepat, *Prosiding Seminar Nasional V SDM Teknologi Nuklir Yogyakarta*, Sekolah Tinggi Teknologi Nuklir BATAN, Yogyakarta
- Sugiarti and Amiruddin, Z., 2008, Pengaruh Jenis Aktivasi Terhadap Kapasitas Adsorpsi Zeolit pada Ion Kromium(VI), *Jurnal Chemica.*, Vol 9, No 2, 20-25.
- Sun, Q., Li, Y., Tang, T., Yuan, Z., Yu, C.P., 2013, Removal of Silver Nanoparticles by Coagulation Processes, *Journal of Hazardous Materials.*, 261, 414-420.
- Vassileva, P., Tzvetkova, P., Lakov, L., Peshev, O., 2008, Thiourcil Modified Activated Carbon as a Sorbent for Some Precious and Heavy Metal Ions, *J. Porous Mater.*, 15, 593-599.
- Virolainen, S., Tyster, M., Haapalainen, M., Sainio, T., 2015, Ion exchange recovery of silver from concentrated base metal-chloride solutions, *Hydrometallurgy.*, 152, 100-106.



- Wahyuni, E.T., Triyono, S., Suherman, 2012, Penentuan Komposisi Kimia Abu Vulkanik Dari Erupsi Gunung Merapi, *Jurnal Manusia dan Lingkungan.*, 19(2), 150-159.
- Wardani, R.K., Fahmi, M.Z., and Permana, A.J., 2011, Kinetika Adsorpsi Pb(II) pada Abu Layang Teraktivasi, Prosiding Seminar Nasional Zeolit VII dan Workshop Zeolit, Universitas Airlangga, 17-18 Oktober 2011.
- Wu, J.J., Lee, H.W., You, J.H., Kau, Y.C., Liu, S.J., 2014, Adsorption of silver ions on polypyrrole embedded electrospun nano brous polyethersulfone membranes, *Journal of Colloid and Interface Science.*, 420, 145- 151.
- Yang, H., Xu, X.R., Xue, M., Li, F.T., Li, G.T., 2008, Hybrid Surfactant Templated Mesoporous Silica Formed in Ethanol and Its Application for Heavy Metal Removal, *J. Hazard. Mater.*, 152, 690-698.
- Yirikoglu, H., Gulfen, M., 2008, Separation and Recovery of Silver(I) Ions from Base Metal Ions by Melamine-formaldehyde-thiourea (MFT) Chelating Resin, *Sep. Sci. Techno.*, 43, 376-388.
- Zafar, S., Khalid, N., Mirza, M.L., 2012, Potential of Rice Husk for The Decontamination of Silver Ions from Aqueous Media, *Sep. Sci. Technol.*, 47, 1793.
- Zakiyyatunni'mah, M., 2016, Modifikasi Abu Kelud 2014 Sebagai Bahan Adsorben Ion Logam Tembaga(II) dan Nikel(II) dengan Asam Asetat, *Skripsi*, UNY, Yogyakarta.