

DAFTAR PUSTAKA

- Abaka-Wood, G. B., Zanin, M., Addai-Mensah, J., and Skinner, W. (2019a): Recovery of rare earth elements minerals from iron oxide–silicate rich tailings – Part 1: Magnetic separation, *Minerals Engineering*, 136(March), 50–61. <https://doi.org/10.1016/j.mineng.2019.02.026>
- Abaka-Wood, G. B., Zanin, M., Addai-Mensah, J., and Skinner, W. (2019b): Recovery of rare earth elements minerals from iron oxide–silicate rich tailings – Part 2: Froth flotation separation, *Minerals Engineering*, 142(July), 105888. <https://doi.org/10.1016/j.mineng.2019.105888>
- Abdel-Rehim, A. M. (2002): An innovative method for processing Egyptian monazite, *Hydrometallurgy*, 67(1–3), 9–17. [https://doi.org/10.1016/S0304-386X\(02\)00134-2](https://doi.org/10.1016/S0304-386X(02)00134-2)
- Ahmad, M. S., Klemeš, J. J., Alhumade, H., Elkamel, A., Mahmood, A., Shen, B., Ibrahim, M., Mukhtar, A., Saqib, S., Asif, S., and Bokhari, A. (2021): Thermo-kinetic study to elucidate the bioenergy potential of Maple Leaf Waste (MLW) by pyrolysis, TGA and kinetic modelling, *Fuel*, 293(November 2020). <https://doi.org/10.1016/j.fuel.2021.120349>
- Alkan, G., Yagmurlu, B., Cakmakoglu, S., Hertel, T., Kaya, Ş., Gronen, L., Stopic, S., and Friedrich, B. (2018): Novel Approach for Enhanced Scandium and Titanium Leaching Efficiency from Bauxite Residue with Suppressed Silica Gel Formation, *Scientific Reports*, 8(1), 5676. <https://doi.org/10.1038/s41598-018-24077-9>
- Alonso, E., Sherman, A. M., Wallington, T. J., Everson, M. P., Field, F. R., Roth, R., and Kirchain, R. E. (2012): Evaluating rare earth element availability: A case with revolutionary demand from clean technologies, *Environmental Science and Technology*, 46(6), 3406–3414. <https://doi.org/10.1021/es203518d>
- Amer, T. E., Abdella, W. M., Wahab, G. M. A., and El-Sheikh, E. M. (2013): A suggested alternative procedure for processing of monazite mineral concentrate, *International Journal of Mineral Processing*, 125, 106–111. <https://doi.org/10.1016/j.minpro.2013.10.004>
- Atmawinata, A., Yahya, F., Widhianto, S., Irianto, D., and Adlir, A. (2014): *Telaah penguatan struktur industri pemetaan potensi logam tanah jarang di indonesia*, Kementrian Perindustrian RI.
- Bagheri, B., Vazifeh Mehrabani, J., and Farrokhpay, S. (2020): Recovery of sphalerite from a high zinc grade tailing, *Journal of Hazardous Materials*, 381(January 2019), 120946. <https://doi.org/10.1016/j.jhazmat.2019.120946>
- Balaram, V. (2019): Rare earth elements: A review of applications, occurrence, exploration, analysis, recycling, and environmental impact, *Geoscience Frontiers*, 10(4), 1285–1303. <https://doi.org/10.1016/j.gsf.2018.12.005>
- Battsengel, A., Batnasan, A., Narankhuu, A., Haga, K., Watanabe, Y., and Shibayama, A. (2018): Recovery of light and heavy rare earth elements from apatite ore using sulphuric acid leaching, solvent extraction and precipitation, *Hydrometallurgy*,



- 179(May), 100–109. <https://doi.org/10.1016/j.hydromet.2018.05.024>
- Berry, L., Galvin, J., Agarwal, V., and Safarzadeh, M. S. (2017): Alkali pug bake process for the decomposition of monazite concentrates, *Minerals Engineering*, 109, 32–41. <https://doi.org/10.1016/j.mineng.2017.02.007>
- Bian, Z., Miao, X., Lei, S., Chen, S. E., Wang, W., and Struthers, S. (2012): The challenges of reusing mining and mineral-processing wastes, *Science*, 337(6095), 702–703. <https://doi.org/10.1126/science.1224757>
- Binnemans, K., Jones, P. T., Blanpain, B., Van Gerven, T., Yang, Y., Walton, A., and Buchert, M. (2013): Recycling of rare earths: A critical review, *Journal of Cleaner Production*, 51, 1–22. <https://doi.org/10.1016/j.jclepro.2012.12.037>
- Biswas, R. K., Habib, M. A., Karmakar, A. K., and Islam, M. R. (2010): A novel method for processing of Bangladeshi zircon: Part I: Baking, and fusion with NaOH, *Hydrometallurgy*, 103(1–4), 124–129. <https://doi.org/10.1016/j.hydromet.2010.03.009>
- Biyantoro, D., Baskoro, A., and Subagiono, R. (2003): Reaksi dijesti itrium dalam pasir senotime, *Prosiding Pertemuan dan Presentasi Ilmiah Penelitian Dasar Ilmu Pengetahuan dan Teknologi Nuklir P3TM*, 84–89.
- Bumhira, L. (2019): *Recovery of Rare Earth Elements from Fluorescent Lamp Phosphors, Sustainable and Economic Waste Management*, Stellenbosch University, 53-99.
- Cao, S., Cao, Y., Ma, Z., Liao, Y., and Zhang, X. (2020): Structural and electronic properties of bastnaesite and implications for surface reactions in flotation, *Journal of Rare Earths*, 38(3), 332–338. <https://doi.org/10.1016/j.jre.2019.04.020>
- Cen, P., Bian, X., and Wu, W. (2020): Isoconversional kinetic analysis of decomposition of bastnaesite concentrates with calcium hydroxide, *Journal of Rare Earths*, 38(12), 1361–1371. <https://doi.org/10.1016/j.jre.2020.01.006>
- Chen, K., Pei, J., Yin, S., Li, S., Peng, J., and Zhang, L. (2018): Leaching behaviour of rare earth elements from low-grade weathered crust elution-deposited rare earth ore using magnesium sulfate, *Clay Minerals*, 53(3), 505–514. <https://doi.org/10.1180/clm.2018.37>
- Chen, S., Feng, Z., Wang, M., Zhao, L., Yu, Z., Xia, C., and Huang, X. (2020): Leaching kinetic study of sulfuric acid roasted mixed-type rare earth concentrate for reducing the solid-waste production and chemical consumption, *Journal of Cleaner Production*, 260, 120989. <https://doi.org/10.1016/j.jclepro.2020.120989>
- Clavier, N., Mesbah, A., Szenknect, S., and Dacheux, N. (2018): Monazite, rhabdophane, xenotime & churchite: Vibrational spectroscopy of gadolinium phosphate polymorphs, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 205, 85–94. <https://doi.org/10.1016/j.saa.2018.07.016>
- Clavier, N., Podor, R., and Dacheux, N. (2011): Crystal chemistry of the monazite structure, *Journal of the European Ceramic Society*, 31(6), 941–976.

<https://doi.org/10.1016/j.jeurceramsoc.2010.12.019>

- Da Silva, R. J. F., Dutra, A. J. B., and Afonso, J. C. (2012): Alkali fusion followed by a two-step leaching of a Brazilian zircon concentrate, *Hydrometallurgy*, 117–118, 93–100. <https://doi.org/10.1016/j.hydromet.2012.02.011>
- Danny, H. Z. (2007): Kemungkinan sebaran zirkon pada endapan placer di Pulau Kalimantan, *Indonesian Journal on Geoscience*, retrieved from internet: <http://ijog.bgl.esdm.go.id>, 2(2), 87–96.
- Demol, J., Ho, E., and Senanayake, G. (2018): Sulfuric acid baking and leaching of rare earth elements, thorium and phosphate from a monazite concentrate: Effect of bake temperature from 200 to 800 °C, *Hydrometallurgy*, 179(June), 254–267. <https://doi.org/10.1016/j.hydromet.2018.06.002>
- Demol, J., Ho, E., Soldenhoff, K., and Senanayake, G. (2019): The sulfuric acid bake and leach route for processing of rare earth ores and concentrates: A review, *Hydrometallurgy*, 188(December 2018), 123–139. <https://doi.org/10.1016/j.hydromet.2019.05.015>
- Dushyantha, N., Batapola, N., Ilankoon, I. M. S. K., Rohitha, S., Premasiri, R., Abeysinghe, B., Ratnayake, N., and Dissanayake, K. (2020): The story of rare earth elements (REEs): Occurrences, global distribution, genesis, geology, mineralogy and global production, *Ore Geology Reviews*, 122(April), 103521. <https://doi.org/10.1016/j.oregeorev.2020.103521>
- El-Moslamy, S. H., Elkady, M. F., Rezk, A. H., and Abdel-Fattah, Y. R. (2017): Applying Taguchi design and large-scale strategy for mycosynthesis of nano-silver from endophytic *Trichoderma harzianum* SYA.F4 and its application against phytopathogens, *Scientific Reports*, 7(October 2016), 1–22. <https://doi.org/10.1038/srep45297>
- El-Mottaleb, M. A., Cheira, M. F., Gouda, G. A. ., and Ahmed, A. S. . (2016): Leaching of Rare Earth Elements from Egyptian Western Desert Phosphate Rocks using HCl, *Chemistry of Advanced Materials*, 1(April), 33–40.
- El Hady, S. M. (2017): A novel procedure for processing of the xenotime mineral concentrate of southwestern Sinai, *Korean Journal of Chemical Engineering*, 34(7), 2049–2055. <https://doi.org/10.1007/s11814-017-0095-0>
- El Hady, S. M., Bakry, A. R., Al Shami, A. A. S., and Fawzy, M. M. (2016): Processing of the xenotime concentrate of Southwestern Sinai via alkali fusion and solvent extraction, *Hydrometallurgy*, 163, 115–119. <https://doi.org/10.1016/j.hydromet.2016.03.019>
- Feng, X. L., Long, Z. Q., Cui, D. L., Wang, L. S., Huang, X. W., and Zhang, G. C. (2013): Kinetics of rare earth leaching from roasted ore of bastnaesite with sulfuric acid, *Transactions of Nonferrous Metals Society of China (English Edition)*, 23(3), 849–854. [https://doi.org/10.1016/S1003-6326\(13\)62538-8](https://doi.org/10.1016/S1003-6326(13)62538-8)
- Galvin, J., and Safarzadeh, M. S. (2018): Decomposition of monazite concentrate in potassium hydroxide solution, *Journal of Environmental Chemical Engineering*,



- 6(1), 1353–1363. <https://doi.org/10.1016/j.jece.2018.01.042>
- García, A. C., Latifi, M., and Chaouki, J. (2020): Kinetics of calcination of natural carbonate minerals, *Minerals Engineering*, 150(February), 106279. <https://doi.org/10.1016/j.mineng.2020.106279>
- García, A. C., Latifi, M., and Chaouki, J. (2021): Kinetic study of calcination of a rare earth ore, *Hydrometallurgy*, 200(December 2020), 105557. <https://doi.org/10.1016/j.hydromet.2021.105557>
- Golev, A., Scott, M., Erskine, P. D., Ali, S. H., and Ballantyne, G. R. (2014): Rare earths supply chains: Current status, constraints and opportunities, *Resources Policy*, 41(1), 52–59. <https://doi.org/10.1016/j.resourpol.2014.03.004>
- Goodenough, K. M., Schilling, J., Jonsson, E., Kalvig, P., Charles, N., Tuduri, J., Deady, E. A., Sadeghi, M., Schiellerup, H., Müller, A., Bertrand, G., Arvanitidis, N., Eliopoulos, D. G., Shaw, R. A., Thrane, K., and Keulen, N. (2016): Europe's rare earth element resource potential: An overview of REE metallogenetic provinces and their geodynamic setting, *Ore Geology Reviews*, 72, 838–856. <https://doi.org/10.1016/j.oregeorev.2015.09.019>
- Gupta, C. K. K., and Krishnamurthy, N. (1992): *Extractive metallurgy of rare earths*, *International Materials Reviews*, 37, 197–248. <https://doi.org/10.1179/imr.1992.37.1.197>
- Gupta, C. K., and Krishnamurthy, N. (2005): *Extractive Metallurgy of Rare Earths* (1st ed.), CRC Press, Mumbai, retrieved from internet: <http://www.ncbi.nlm.nih.gov/pubmed/873411>.
- Hajji, H., Nasr, S., Millot, N., and Salem, E. Ben (2019): Study of the effect of milling parameters on mechanosynthesis of hydroxyfluorapatite using the Taguchi method, *Powder Technology*, 356, 566–580. <https://doi.org/10.1016/j.powtec.2019.08.087>
- Han, K. N. (2020): Characteristics of precipitation of rare earth elements with various precipitants, *Minerals*, 10(2). <https://doi.org/10.3390/min10020178>
- Harjanto, S., Virdhian, S., and Afrilinda, E. (2013): Characterization of Indonesia Rare Earth Minerals and Their Potential Processing Techniques, *Rare Earth*, 52(February), 99–108.
- Hirai, H., Masui, T., Imanaka, N., and Adachi, G. ya (2004): Characterization and thermal behavior of amorphous rare earth phosphates, *Journal of Alloys and Compounds*, 374(1–2), 84–88. <https://doi.org/10.1016/j.jallcom.2003.11.069>
- Horovitz, C. T. (1975): *Scandium Its Occurrence, Chemistry, Physics, Metallurgy, Biology and Technology*, Academic Press, London, 111–132.
- Huang, Y., Dou, Z., Zhang, T. an, and Liu, J. (2017): Leaching kinetics of rare earth elements and fluoride from mixed rare earth concentrate after roasting with calcium hydroxide and sodium hydroxide, *Hydrometallurgy*, 173(July), 15–21. <https://doi.org/10.1016/j.hydromet.2017.07.004>



- Huang, Y., Zhang, T., Dou, Z., Han, G., Cao, Y., and Hou, C. (2019): Decomposition mechanism of a mixed rare earth concentrate with sodium hydroxide in the microwave heating process, *Minerals Engineering*, 132(November 2018), 220–227. <https://doi.org/10.1016/j.mineng.2018.12.021>
- Huang, Y., Zhang, T., Dou, Z., Lv, G., Han, G., and Peng, W. (2019): Microwave strengthens decomposition of mixed rare earth concentrate: Microwave absorption characteristics, *Journal of Rare Earths*, 37(5), 541–546. <https://doi.org/10.1016/j.jre.2018.08.010>
- Huang, Y., Zhang, T., Liu, J., Dou, Z., and Tian, J. (2016): Decomposition of the mixed rare earth concentrate by microwave-assisted method, *Journal of Rare Earths*, 34(5), 529–535. [https://doi.org/10.1016/S1002-0721\(16\)60058-3](https://doi.org/10.1016/S1002-0721(16)60058-3)
- Hung, N. T., Thuan, L. B., Thanh, T. C., Watanabe, M., Nhuan, H., Khoai, D. Van, Thuy, N. T., Tung, N. Van, Aoyagi, N., Tra, D. T. T., Minh, N. T., Jha, M. K., Lee, J.-Y., and Jyothi, R. K. (2020): Optimization of sulfuric acid leaching of a Vietnamese rare earth concentrate, *Hydrometallurgy*, 191(September 2019), 105195. <https://doi.org/10.1016/j.hydromet.2019.105195>
- Ilieva, D., Jivov, B., Kovacheva, D., Tsacheva, T., Dimitriev, Y., Bogachev, G., and Petkov, C. (2001): FT-IR and Raman spectra of Gd phosphate crystals and glasses, *Journal of Non-Crystalline Solids*, 293–295(1), 562–568. [https://doi.org/10.1016/S0022-3093\(01\)00778-5](https://doi.org/10.1016/S0022-3093(01)00778-5)
- Ilieva, D., Kovacheva, D., Petkov, C., and Bogachev, G. (2001): Vibrational spectra of R(PO₃)₃ metaphosphates (R= Ga, In, Y, Sm, Gd, Dy), *Journal of Raman Spectroscopy*, 32(11), 893–899. <https://doi.org/10.1002/jrs.753>
- Janković, B. (2008): Kinetic analysis of the nonisothermal decomposition of potassium metabisulfite using the model-fitting and isoconversional (model-free) methods, *Chemical Engineering Journal*, 139(1), 128–135. <https://doi.org/10.1016/j.cej.2007.07.085>
- Jha, M. K., Kumari, A., Choubey, P. K., Lee, J. C., Kumar, V., and Jeong, J. (2012): Leaching of lead from solder material of waste printed circuit boards (PCBs), *Hydrometallurgy*, 121–124, 28–34. <https://doi.org/10.1016/j.hydromet.2012.04.010>
- Jha, M. K., Kumari, A., Panda, R., Rajesh Kumar, J., Yoo, K., and Lee, J. Y. (2016): Review on hydrometallurgical recovery of rare earth metals, *Hydrometallurgy*, 165, 2–26. <https://doi.org/10.1016/j.hydromet.2016.01.035>
- Jordens, A., Cheng, Y. P., and Waters, K. E. (2013): A review of the beneficiation of rare earth element bearing minerals, *Minerals Engineering*, 41, 97–114. <https://doi.org/10.1016/j.mineng.2012.10.017>
- Kanazawa, Y., and Kamitani, M. (2006): Rare earth minerals and resources in the world, *Journal of Alloys and Compounds*, 408–412, 1339–1343. <https://doi.org/10.1016/j.jallcom.2005.04.033>
- Khawam, A., and Flanagan, D. R. (2006): Solid-State Kinetic Models: Basics and Mathematical Fundamentals, *Phys Chem*, 110(35), 17315–17328.

<https://doi.org/10.1021/jp062746a>

- Kim, W., Bae, I., Chae, S., and Shin, H. (2009): Mechanochemical decomposition of monazite to assist the extraction of rare earth elements, *Journal of Alloys and Compounds*, 486(1–2), 610–614. <https://doi.org/10.1016/j.jallcom.2009.07.015>
- Kim, Y. S. (1969): *The reactivity of some economic minerals with solid sodium hydroxyde*.
- Kinnunen, P., Ismailov, A., Solismaa, S., Sreenivasan, H., Räisänen, M. L., Levänen, E., and Illikainen, M. (2018): Recycling mine tailings in chemically bonded ceramics – A review, *Journal of Cleaner Production*, 174, 634–649. <https://doi.org/10.1016/j.jclepro.2017.10.280>
- Kongkaew, N., Pruksakit, W., and Patumsawad, S. (2015): *Thermogravimetric Kinetic Analysis of the Pyrolysis of Rice Straw*, *Energy Procedia*, Elsevier B.V., 79, 663–670. <https://doi.org/10.1016/j.egypro.2015.11.552>
- Kristanto, J., Azis, M. M., and Purwono, S. (2021): Multi-distribution activation energy model on slow pyrolysis of cellulose and lignin in TGA/DSC, *Heliyon*, 7(7), e07669. <https://doi.org/10.1016/j.heliyon.2021.e07669>
- Kumari, A., Jha, M. K., Yoo, K., Panda, R., Lee, J. Y., Kumar, J. R., and Pathak, D. D. (2019): Advanced process to dephosphorize monazite for effective leaching of rare earth metals (REMs), *Hydrometallurgy*, 187(February 2018), 203–211. <https://doi.org/10.1016/j.hydromet.2019.05.013>
- Kumari, A., Panda, R., Jha, M. K., Kumar, J. R., and Lee, J. Y. (2015): Process development to recover rare earth metals from monazite mineral: A review, *Minerals Engineering*, 79, 102–115. <https://doi.org/10.1016/j.mineng.2015.05.003>
- Kumari, A., Panda, R., Jha, M. K., Lee, J. Y., Kumar, J. R., and Kumar, V. (2015): Thermal treatment for the separation of phosphate and recovery of rare earth metals (REMs) from Korean monazite, *Journal of Industrial and Engineering Chemistry*, 21, 696–703. <https://doi.org/10.1016/j.jiec.2014.03.039>
- Kusrini, E., Zulys, A., Rachmana, A., Wulandari, D. A., Muharam, Y., Usman, A., and Rahman, A. (2020): Enrichment and extraction of lanthanum from Belitung silica sand using sulfuric acid heap leaching, precipitation and complexation with phytic acid, *Materials Today: Proceedings*, 31(xxxx), 421–425. <https://doi.org/10.1016/j.matpr.2020.02.815>
- Leybourne, M. I., Goodfellow, W. D., Boyle, D. R., and Hall, G. M. (2000): Rapid development of negative Ce anomalies in surface waters and contrasting REE patterns in groundwaters associated with Zn-Pb massive sulphide deposits, *Applied Geochemistry*, 15(6), 695–723. [https://doi.org/10.1016/S0883-2927\(99\)00096-7](https://doi.org/10.1016/S0883-2927(99)00096-7)
- Li, M., Li, J., Zhang, D., Gao, K., Wang, H., Xu, W., Geng, J., Zhang, X., and Ma, X. (2020): Decomposition of mixed rare earth concentrate by NaOH roasting and kinetics of hydrochloric acid leaching process, *Journal of Rare Earths*, 38(9), 1019–1029. <https://doi.org/10.1016/j.jre.2019.06.012>



- Li, M., Zhang, X., Liu, Z., Hu, Y., Wang, M., Liu, J., and Yang, J. (2013): Kinetics of leaching fluoride from mixed rare earth concentrate with hydrochloric acid and aluminum chloride, *Hydrometallurgy*, 140, 71–76. <https://doi.org/10.1016/j.hydromet.2013.09.004>
- Lindsay, M. B. J., Moncur, M. C., Bain, J. G., Jambor, J. L., Ptacek, C. J., and Blowes, D. W. (2015): Geochemical and mineralogical aspects of sulfide mine tailings, *Applied Geochemistry*, 57, 157–177. <https://doi.org/10.1016/j.apgeochem.2015.01.009>
- Liu, J., Song, J., Qi, T., Zhang, C., and Qu, J. (2016): Controlling the formation of Na₂ZrSiO₅ in alkali fusion process for zirconium oxychloride production, *Advanced Powder Technology*, 27(1), 1–8. <https://doi.org/10.1016/j.appt.2015.08.005>
- Liu, T., and Chen, J. (2021): Extraction and separation of heavy rare earth elements : A review, *Separation and Purification Technology*, 276(June), 119263. <https://doi.org/10.1016/j.seppur.2021.119263>
- Long, K. R., Van Gosen, B. S., Foley, N. K., and Cordier, D. (2012): *The Principal Rare Earth Elements Deposits of the United States: A Summary of Domestic Deposits and a Global Perspective*, (R. Sinding-Larsen and F.-W. Wellmer, Eds.) *Non-Renewable Resource Issues: Geoscientific and Societal Challenges*, Springer Netherlands, Dordrecht, 2012, 131-155. <https://doi.org/10.1007/978-90-481-8679-2>
- Lymperopoulou, T., Georgiou, P., Tsakanika, L.-A., Hatzilyberis, K., and Ochsenkuehn-Petropoulou, M. (2019): Optimizing Conditions for Scandium Extraction from Bauxite Residue Using Taguchi Methodology, *Minerals*, 9(4), 236. <https://doi.org/10.3390/min9040236>
- Lyu, X., Yao, G., Wang, Z., Wang, Q., and Li, L. (2020): Hydration kinetics and properties of cement blended with mechanically activated gold mine tailings, *Thermochimica Acta*, 683(November 2019), 178457. <https://doi.org/10.1016/j.tca.2019.178457>
- Mahmood, S., Qureshi, A. J., and Talamona, D. (2018): Taguchi based process optimization for dimension and tolerance control for fused deposition modelling, *Additive Manufacturing*, 21(2010), 183–190. <https://doi.org/10.1016/j.addma.2018.03.009>
- Maia, A. A. D., and de Moraes, L. C. (2016): Kinetic parameters of red pepper waste as biomass to solid biofuel, *Bioresource Technology*, 204, 157–163. <https://doi.org/10.1016/j.biortech.2015.12.055>
- Mäkinen, J., Salo, M., Khoshkhoo, M., Sundkvist, J.-E., and Kinnunen, P. (2020): Bioleaching of cobalt from sulfide mining tailings; a mini-pilot study, *Hydrometallurgy*, 594(Iii), 105418. <https://doi.org/10.1016/j.hydromet.2020.105418>
- Mancheri, N. A., Sprecher, B., Bailey, G., Ge, J., and Tukker, A. (2019): Effect of Chinese policies on rare earth supply chain resilience, *Resources, Conservation and Recycling*, 142(November 2018), 101–112. <https://doi.org/10.1016/j.resconrec.2018.11.017>



- Manhique, A., Kwela, Z., and Focke, W. W. (2003): De wet process for the beneficiation of zircon: Optimization of the alkali fusion step, *Industrial and Engineering Chemistry Research*, 42(4), 777–783. <https://doi.org/10.1021/ie020140c>
- Martínez-Klimov, M. E., Ramírez-Vidal, P., Tejeda, P. R., and Klimova, T. E. (2019): Synergy between sodium carbonate and sodium titanate nanotubes in the transesterification of soybean oil with methanol, *Catalysis Today*, 353(August 2019), 119–125. <https://doi.org/10.1016/j.cattod.2019.08.027>
- McLennan, S. M., and Ross Taylor, S. (2012): Geology, Geochemistry and Natural Abundances, *Encyclopedia of Inorganic and Bioinorganic Chemistry*. <https://doi.org/10.1002/9781119951438.eibc2004>
- Merdun, H., and Laougé, Z. B. (2021): Kinetic and thermodynamic analyses during co-pyrolysis of greenhouse wastes and coal by TGA, *Renewable Energy*, 163, 453–464. <https://doi.org/10.1016/j.renene.2020.08.120>
- Mianowski, A., Radko, T., and Siudyga, T. (2020): Kinetic compensation effect of isoconversional methods, *Reaction Kinetics, Mechanisms and Catalysis*, 132(1), 37–58. <https://doi.org/10.1007/s11144-020-01898-2>
- Mondal, S., Paul, B., Kumar, V., Singh, D. K., and Chakravartty, J. K. (2015): Parametric optimization for leaching of cobalt from Sukinda ore of lateritic origin - A Taguchi approach, *Separation and Purification Technology*, 156, 827–834. <https://doi.org/10.1016/j.seppur.2015.11.007>
- Munive, G. T., Encinas, M. A., Salazar Campoy, M. M., Álvarez, V. E., Vazquez, V. M., and Choque, D. C. (2019): Leaching Gold and Silver with an Alternative System, Glycine: Thiosulfate from Mineral Tailings, *Jom*. <https://doi.org/10.1007/s11837-019-03652-z>
- Murty, C. H. V. G. K., Upadhyay, R., and Asokan, S. (2007): Recovery of zircon from Sattankulam deposit in India — problems and prospects, *The 6th International Heavy Minerals Conference 'Back to Basics,'* 69–74.
- Mutawali, M. A., and Sudaryadi (2020): Ftir untuk kontrol reaksi stoikiometri peleburan zirkon dengan naoh, *GANENDRA Majalah IPTEK Nuklir*, 4(1), 19–27.
- Narasimha Murty, B., Balakrishna, P., Yadav, R. B., and Ganguly, C. (2001): Influence of temperature of precipitation on agglomeration and other powder characteristics of ammonium diuranate, *Powder Technology*, 115(2), 167–183. [https://doi.org/10.1016/S0032-5910\(00\)00336-3](https://doi.org/10.1016/S0032-5910(00)00336-3)
- Nasab, M. E., Sam, A., and Milani, S. A. (2011): Determination of optimum process conditions for the separation of thorium and rare earth elements by solvent extraction, *Hydrometallurgy*, 106(3–4), 141–147. <https://doi.org/10.1016/j.hydromet.2010.12.014>
- Ni'am, A. C., Wang, Y. F., Chen, S. W., and You, S. J. (2019): Recovery of rare earth elements from waste permanent magnet (WPMs) via selective leaching using the Taguchi method, *Journal of the Taiwan Institute of Chemical Engineers*, 97, 137–145. <https://doi.org/10.1016/j.jtice.2019.01.006>



- Nn (2021): Product category:chemical synthesis:synthetic reagents:acids & bases., retrieved April 14, 2021, from internet: <https://www.sigmaaldrich.com/catalog>.
- Norman, A., and et al. (2014): Critical Minerals: Rare Earths and the U.S. Economy, *National Center for Policy Analysis*2, retrieved from internet: <https://www.ncpa.org/pdfs/bg175.pdf>, (175), 16.
- Önal, M. A. R., Borra, C. R., Guo, M., Blanpain, B., and Van Gerven, T. (2015): Recycling of NdFeB Magnets Using Sulfation, Selective Roasting, and Water Leaching, *Journal of Sustainable Metallurgy*, 1(3), 199–215. <https://doi.org/10.1007/s40831-015-0021-9>
- Özsin, G., and Pütün, A. E. (2018): Co-pyrolytic behaviors of biomass and polystyrene: Kinetics, thermodynamics and evolved gas analysis, *Korean Journal of Chemical Engineering*, 35(2), 428–437. <https://doi.org/10.1007/s11814-017-0308-6>
- Panda, R., Kumari, A., Jha, M. K., Hait, J., Kumar, V., Rajesh Kumar, J., and Lee, J. Y. (2014): Leaching of rare earth metals (REMs) from Korean monazite concentrate, *Journal of Industrial and Engineering Chemistry*, 20(4), 2035–2042. <https://doi.org/10.1016/j.jiec.2013.09.028>
- Parhi, P. K., Park, J. T., Park, K. H., Nam, C. W., and Barik, S. P. (2013): Extraction of rare earth metals from deep sea nodule using H₂SO₄ solution, *International Journal of Mineral Processing*, 119, 89–92. <https://doi.org/10.1016/j.minpro.2013.01.005>
- Parthasarathy, P., Fernandez, A., Al-Ansari, T., Mackey, H. R., Rodriguez, R., and McKay, G. (2021): Thermal degradation characteristics and gasification kinetics of camel manure using thermogravimetric analysis, *Journal of Environmental Management*, 287(January), 112345. <https://doi.org/10.1016/j.jenvman.2021.112345>
- Peiravi, M., Dehghani, F., Ackah, L., Baharlouei, A., Godbold, J., Liu, J., Mohanty, M., and Ghosh, T. (2021): A Review of Rare-Earth Elements Extraction with Emphasis on Non-conventional Sources: Coal and Coal Byproducts, Iron Ore Tailings, Apatite, and Phosphate Byproducts, *Mining, Metallurgy and Exploration*, 38(1), 1–26. <https://doi.org/10.1007/s42461-020-00307-5>
- Pepper, R. A., Couperthwaite, S. J., and Millar, G. J. (2016): Comprehensive examination of acid leaching behaviour of mineral phases from red mud: Recovery of Fe, Al, Ti, and Si, *Minerals Engineering*, 99, 8–18. <https://doi.org/10.1016/j.mineng.2016.09.012>
- Plessis, W. Du, Pienaar, A. D., Postma, C. J., and Crouse, P. L. (2016): Effect of the value of x in NH₄F·xHF on the digestion of plasma-dissociated zircon, *International Journal of Mineral Processing*, 147, 43–47. <https://doi.org/10.1016/j.minpro.2016.01.002>
- Poernomo, H., Biyantoro, D., and Purwani, M. V. (2016): Kajian Konsep Teknologi Pengolahan Pasir Zirkon Lokal yang Mengandung Monasit, Senotim, dan Ilmenit, *Eksplorium*, 37(2), 73–88.
- Prameswara, G., Mulyono, P., Prasetya, A., Poernomo, H., and Trisnawati, I. (2019):



Ekstraksi Logam Tanah Jarang (LTJ) dan Logam Berharga Hasil Fusi Alkali Tailing Zirkon, *Seminar Teknik Kimia Keuangan*, 1–7.

- Prameswara, G., Trisnawati, I., Mulyono, P., Prasetya, A., and Petrus, H. T. B. M. (2021): Leaching Behaviour and Kinetic of Light and Heavy Rare Earth Elements (REE) from Zircon Tailings in Indonesia, *JOM*, 73(4), 988–998. <https://doi.org/10.1007/s11837-021-04584-3>
- Prameswara, G., Trisnawati, I., Poernomo, H., Mulyono, P., Prasetya, A., and Petrus, H. T. B. M. (2020): Kinetics of Yttrium Dissolution from Alkaline Fusion on Zircon Tailings, *Mining, Metallurgy & Exploration*, 37(4), 1297–1305. <https://doi.org/10.1007/s42461-020-00220-x>
- Prassanti, R. (2012): Digesti Monasit Bangka Dengan Asam Sulfat, *Eksplorium*, 33(1), 41–54.
- Purwanti, T., Setyadji, M., Astuti, W., Perdana, I., and Petrus, H. T. B. M. (2020): Phosphate Decomposition by Alkaline Roasting to Concentrate Rare Earth Elements from Monazite of Bangka Island, Indonesia, *Journal of Mining Science*, 56(3), 477–485. <https://doi.org/10.1134/S1062739120036763>
- Qin, T., Wu, F., Wu, Z., and Huang, F. (2016): First-principles calculations of equilibrium fractionation of O and Si isotopes in quartz, albite, anorthite, and zircon, *Contributions to Mineralogy and Petrology*, 171(11), 1–14. <https://doi.org/10.1007/s00410-016-1303-3>
- Sadri, F., Nazari, A. M., and Ghahreman, A. (2017): A review on the cracking, baking and leaching processes of rare earth element concentrates, *Journal of Rare Earths*, 35(8), 739–752. [https://doi.org/10.1016/S1002-0721\(17\)60971-2](https://doi.org/10.1016/S1002-0721(17)60971-2)
- Sadri, F., Rashchi, F., and Amini, A. (2017): Hydrometallurgical digestion and leaching of Iranian monazite concentrate containing rare earth elements Th, Ce, La and Nd, *International Journal of Mineral Processing*, 159, 7–15. <https://doi.org/10.1016/j.minpro.2016.12.003>
- Sarbishei, S., and Khajavi, L. T. (2019): Kinetic analysis on nickel laterite ore calcination using model-free and model-fitting methods, *Minerals Engineering*, 136(March), 129–139. <https://doi.org/10.1016/j.mineng.2019.03.010>
- Senanayake, G., Jayasekera, S., Bandara, A. M. T. S., Koenigsberger, E., Koenigsberger, L., and Kyle, J. (2016): Rare earth metal ion solubility in sulphate-phosphate solutions of pH range –0.5 to 5.0 relevant to processing fluorapatite rich concentrates: Effect of calcium, aluminium, iron and sodium ions and temperature up to 80 °C, *Minerals Engineering*, 98, 169–176. <https://doi.org/10.1016/j.mineng.2016.07.022>
- Setyadji, M., and Nurly, H. F. (2018): Baking process of mineral carrier of rare earth metals with sodium hydroxide using muffle furnace, *Journal of Physics: Conference Series*, 1091, 012012. <https://doi.org/10.1088/1742-6596/1091/1/012012>
- Slopiecka, K., Bartocci, P., and Fantozzi, F. (2011): Thermogravimetric analysis and kinetic study of poplar wood pyrolysis, *Applied Energy*, 97(May), 491–497.

<https://doi.org/10.1016/j.apenergy.2011.12.056>

- Soltani, F., Abdollahy, M., Petersen, J., Ram, R., Becker, M., Koleini, S. M. J., and Moradkhani, D. (2018): Leaching and recovery of phosphate and rare earth elements from an iron-rich fluorapatite concentrate: Part I: Direct baking of the concentrate, *Hydrometallurgy*, 177, 66–78. <https://doi.org/10.1016/j.hydromet.2018.02.014>
- Song, J., Fan, J. F., Liu, J. C., Liu, R., Qu, J. K., and Qi, T. (2015): A two-step zircon decomposition method to produce zirconium oxychloride: alkali fusion and water leaching, *Rare Metals*. <https://doi.org/10.1007/s12598-015-0537-y>
- Srikanth, S., Devi, V. L., and Kumar, R. (2016): Unfolding the complexities of mechanical activation assisted alkali leaching of zircon (ZrSiO₄), *Hydrometallurgy*, 165, 125–136. <https://doi.org/10.1016/j.hydromet.2015.09.024>
- Stopic, S., and Friedrich, B. (2016): Kinetics of yttrium dissolution from waste ceramic dust, *Military Technical Courier*, 64(2), 383–395. <https://doi.org/10.5937/vojtehg64-8668>
- Stopić, S., and Friedrich, B. (2018): Leaching of rare earth elements with sulfuric acid from bastnasite ores, *Vojnotehnicki Glasnik*, 66(4), 757–770. <https://doi.org/10.5937/vojtehg66-17177>
- Sun, H., Zhao, F., Zhang, M., and Li, J. (2012): Behavior of rare earth elements in acid coal mine drainage in Shanxi Province, China, *Environmental Earth Sciences*, 67(1), 205–213. <https://doi.org/10.1007/s12665-011-1497-7>
- Suprpto, S. J. (2007): Tinjauan Tailing Sebagai Sumber Daya, *Buletin Sumber Daya Geologi*, 2(3), 52–58. <https://doi.org/10.47599/bsdg.v2i3.219>
- Suprpto, S. J. (2009): Tinjauan tentang unsur tanah jarang, *Buletin Sumber Daya Geologi*, 4(1), 36–45.
- Suseno, T. (2015): Analisis Prospek Pasir Zirkon Indonesia Di Pasar Dunia, *Teknologi Mineral Dan Batubara*, 11(1), 61–77.
- Suseno, T., Suciyanti, M., and Suherman, I. (2015): Analisis Prospek Pemanfaatan Zirkon Dalam Industri Keramik , Frit , Bata Tahan Api Dan Pengecoran Logam, *Jurnal Teknologi Mineral Dan Batubara*, retrieved from internet: <https://jurnal.tekmira.esdm.go.id/index.php/minerba/article/view/709>, 11(2), 93–106.
- Tabal, A., Barakat, A., Aboulkas, A., and El harfi, K. (2021): Pyrolysis of ficus nitida wood: Determination of kinetic and thermodynamic parameters, *Fuel*, 283(September 2020), 119253. <https://doi.org/10.1016/j.fuel.2020.119253>
- Teixeira, L. A. V., Silva, R. G., Avelar, A., Majuste, D., and Ciminelli, V. S. T. (2019): Selective Extraction of Rare Earth Elements from Monazite Ores with High Iron Content, *Mining, Metallurgy & Exploration*. <https://doi.org/10.1007/s42461-018-0035-5>
- Thompson, W., Lombard, A., Santiago, E., and Singh, A. (2012): Proceedings of the 10th



- International Congress for Applied Mineralogy (ICAM), *Proceedings of the 10th International Congress for Applied Mineralogy (ICAM)*, 665–672.
<https://doi.org/10.1007/978-3-642-27682-8>
- Trinopiawan, K., Mubarak, M. Z., Mellawati, J., and Ani, B. Y. (2016): Rare Earth Elements Leaching From Tin Slag Using Acid Chloride After Alkaline Fusion Process, *Eksplorium*, 37(1), 41–50.
- Trisnawati, I., Prameswara, G., Mulyono, P., Prasetya, A., and Petrus, H. T. B. M. (2020): Sulfuric Acid Leaching of Heavy Rare Earth Elements (HREEs) from Indonesian Zircon Tailing, *International Journal of Technology*, 11(4), 804–816.
<https://doi.org/10.14716/ijtech.v11i4.4037>
- Trisnawati, I., Prameswara, G., Rozana, K., Petrus, H. T. B. M., Prasetya, A., and Mulyono, P. (2020): Pelindian Zirkonium dari Tailing Magnetik Pasir Zirkon Hasil Roasting Menggunakan NaOH, *Metalurgi*, 35, 83–88.
- Trisnawati, I., Winmoko, B. A., Poernomo, H., Bendiyasa, I. M., and Petrus, H. T. M. B. (2019): Desain Taguchi untuk Optimasi Pengambilan Logam Tanah Jarang dari Tailing Pasir Zirkon Menggunakan Metode Presipitasi Asam Oksalat: Pengaruh pH dan Suhu Taguchi, *Seminar Geologi Nuklir dan Sumber Daya Tambang Tahun 2019*, 341–348.
- Trisnawati, I., Yulandra, A., Prameswara, G., Pusparini, W. R., Mulyono, P., Prasetya, A., and Petrus, H. T. B. M. (2021): Optimization of Multistage Precipitation Processes for Rare Earth Element Purification from Indonesian Zircon Tailings, *Journal of Sustainable Metallurgy*. <https://doi.org/10.1007/s40831-021-00353-3>
- Turmanova, S. C., Genieva, S. D., Dimitrova, A. S., and Vlaev, L. T. (2008): Non-isothermal degradation kinetics of filled with rice husk ash polypropylene composites, *Express Polymer Letters*, 2(2), 133–146.
<https://doi.org/10.3144/expresspolymlett.2008.18>
- Virdhian, S. (2014): Karakterisasi Mineral Tanah Jarang Ikutan Timah Dan Potensi Pengembangan Industri Berbasis Unsur Tanah Jarang, *Metal Indonesia*, 36, 61–69.
- Vyazovkin, S., Burnham, A. K., Favergeon, L., Koga, N., Moukhina, E., Pérez-Maqueda, L. A., and Sbirrazzuoli, N. (2020): ICTAC Kinetics Committee recommendations for analysis of multi-step kinetics, *Thermochimica Acta*, 689(March), 178597.
<https://doi.org/10.1016/j.tca.2020.178597>
- Walawalkar, M., Nichol, C. K., and Azimi, G. (2016): Process investigation of the acid leaching of rare earth elements from phosphogypsum using HCl, HNO₃, and H₂SO₄, *Hydrometallurgy*, 166, 195–204.
<https://doi.org/10.1016/j.hydromet.2016.06.008>
- Wang, L., Ji, B., Hu, Y., Liu, R., and Sun, W. (2017): A review on in situ phytoremediation of mine tailings, *Chemosphere*, 184, 594–600.
<https://doi.org/10.1016/j.chemosphere.2017.06.025>
- Wang, L., and Liang, T. (2016): Anomalous abundance and redistribution patterns of rare earth elements in soils of a mining area in Inner Mongolia, China, *Environmental*



Science and Pollution Research, 23(11), 11330–11338.
<https://doi.org/10.1007/s11356-016-6351-8>

- Wang, P., Sun, Z., Hu, Y., and Cheng, H. (2019): Leaching of heavy metals from abandoned mine tailings brought by precipitation and the associated environmental impact, *Science of the Total Environment*, 695, 133893. <https://doi.org/10.1016/j.scitotenv.2019.133893>
- Wang, Z., Xu, Q., Xu, M., Wang, S., and You, J. (2015): In situ spectroscopic studies of decomposition of ZrSiO₄ during alkali fusion process using various hydroxides, *RSC Advances*, 5(15), 11658–11666. <https://doi.org/10.1039/c4ra12305k>
- Wasito, B., and Biyantoro, D. (2009): Optimasi Proses Pembuatan Oksida Logam Tanah Jarang Dari Pasir Senotim Dan Analisis Produk Dengan Spektrometer Pendar Sinar-X, *Sekolah Tinggi Teknologi Nuklir- BATAN*, V(November), 677–686.
- Webster, J. G., Swedlund, P. J., and Webster, K. S. (1998): Trace metal adsorption onto an acid mine drainage iron(III) oxy hydroxy sulfate, *Environmental Science and Technology*, 32(10), 1361–1368. <https://doi.org/10.1021/es9704390>
- Wenyuan, W., Xue, B., Shuchen, S., and Ganfeng, T. (2006): Study on Roasting Decomposition of Mixed Rare Earth Concentrate in CaO-NaCl-CaCl₂, *Journal of Rare Earths*, 24(1 SUPPL. 1), 23–27. [https://doi.org/10.1016/S1002-0721\(07\)60313-5](https://doi.org/10.1016/S1002-0721(07)60313-5)
- Wu, S., Wang, L., Zhao, L., Zhang, P., El-Shall, H., Moudgil, B., Huang, X., and Zhang, L. (2018): Recovery of rare earth elements from phosphate rock by hydrometallurgical processes – A critical review, *Chemical Engineering Journal*, 335(October 2017), 774–800. <https://doi.org/10.1016/j.cej.2017.10.143>
- Xaba, S. M., Nete, M., and Purcell, W. (2018): Concentration of rare earth elements from monazite by selective precipitation, *IOP Conference Series: Materials Science and Engineering*, 430(1), 012006. <https://doi.org/10.1088/1757-899X/430/1/012006>
- Xie, F., Zhang, T. A., Dreisinger, D., and Doyle, F. (2014): A critical review on solvent extraction of rare earths from aqueous solutions, *Minerals Engineering*, 56, 10–28. <https://doi.org/10.1016/j.mineng.2013.10.021>
- Xu, Y., and Chen, B. (2013): Investigation of thermodynamic parameters in the pyrolysis conversion of biomass and manure to biochars using thermogravimetric analysis, *Bioresource Technology*, 146, 485–493. <https://doi.org/10.1016/j.biortech.2013.07.086>
- Xu, Y., Liu, H., Meng, Z., Cui, J., Zhao, W., and Li, L. (2012): Decomposition of bastnasite and monazite mixed rare earth minerals calcined by alkali liquid, *Journal of Rare Earths*, 30(2), 155–158. [https://doi.org/10.1016/S1002-0721\(12\)60014-3](https://doi.org/10.1016/S1002-0721(12)60014-3)
- Xue, B., Jianli, C., Zhihua, Z., Shaohua, Y., Yao, L., Fengyun, Z., and Wenyuan, W. (2010): Kinetics of mixed rare earths minerals decomposed by CaO with NaCl-CaCl₂ melting salt, *Journal of Rare Earths*, 28(SUPPL. 1), 86–90. [https://doi.org/10.1016/S1002-0721\(10\)60268-2](https://doi.org/10.1016/S1002-0721(10)60268-2)



- Xue, B., Shao-hua, Y., Yao, L., and Wen-yuan, W. (2011): Leaching kinetics of bastnaesite concentrate in HCl solution, *Transactions of Nonferrous Metals Society of China*, 21(10), 2306–2310. [https://doi.org/10.1016/S1003-6326\(11\)61012-1](https://doi.org/10.1016/S1003-6326(11)61012-1)
- Yagmurlu, B., Dittrich, C., and Friedrich, B. (2017): Precipitation Trends of Scandium in Synthetic Red Mud Solutions with Different Precipitation Agents, *Journal of Sustainable Metallurgy*, 3(1), 90–98. <https://doi.org/10.1007/s40831-016-0098-9>
- Yang, K., Fan, H., Pirajno, F., and Li, X. (2019): The bayan Obo (China) giant REE accumulation conundrum elucidated by intense magmatic differentiation of carbonatite, *Geology*, 47(12), 1198–1202. <https://doi.org/10.1130/G46674.1>
- Yuan, S., Yang, H., Xue, X.-X., and Zhou, Y. (2017): Roasting decomposition of mixed rare earth tailings by CaO in reducing atmosphere, *Rare Metals*, 7(6), 213. <https://doi.org/10.3390/met7060213>
- Yulandra, A., Trisnawati, I., Bendiyasa, I. M., Pusparini, W. R., and Petrus, H. T. B. M. (2020): Optimasi Presipitasi Logam Tanah Jarang dari Campuran Konsentrat Logam Tanah Jarang dengan Metode "Response Surface Methodology", *Metal Indonesia*, 42(1), 28. <https://doi.org/10.32423/jmi.2020.v42.28-34>
- Zhai, J., Wang, H., Chen, P., Hu, Y., and Sun, W. (2020): Recycling of iron and titanium resources from early tailings: From fundamental work to industrial application, *Chemosphere*, 242, 125178. <https://doi.org/10.1016/j.chemosphere.2019.125178>
- Zhang, J., and Edwards, C. (2013): Mineral decomposition and leaching processes for treating rare earth ore concentrates, *Canadian Metallurgical Quarterly*, 52(3), 243–248. <https://doi.org/10.1179/1879139513Y.00000000084>
- Zhang, J., Zhao, B., and Schreiner, B. (2016): *Rare Earth Beneficiation and Hydrometallurgical Processing, Separation Hydrometallurgy of Rare Earth Elements*, Springer International Publishing, Cham, 1-259. <https://doi.org/10.1007/978-3-319-28235-0>
- Zhang, L., Wang, X., Chen, H., and Jiang, F. (2014): Adsorption of Pb(II) using magnetic titanate nanotubes prepared via two-step hydrothermal method, *Clean - Soil, Air, Water*, 42(7), 947–955. <https://doi.org/10.1002/clen.201300582>
- Zhang, Q., and Saito, F. (1998): Non-thermal process for extracting rare earths from bastnaesite by means of mechanochemical treatment, *Hydrometallurgy*, 47(2–3), 231–241. [https://doi.org/10.1016/S0304-386X\(97\)00048-0](https://doi.org/10.1016/S0304-386X(97)00048-0)
- Zhang, W., and Honaker, R. Q. (2018): Rare earth elements recovery using staged precipitation from a leachate generated from coarse coal refuse, *International Journal of Coal Geology*, 195(November 2017), 189–199. <https://doi.org/10.1016/j.coal.2018.06.008>
- Zhao, S., Lü, X., Sun, Y., and Huang, J. (2021): Thermodynamic mechanism evaluate the feasibility of oil shale pyrolysis by topochemical heat, *Scientific Reports*, 11(1), 5365. <https://doi.org/10.1038/s41598-021-84757-x>
- Zhou, B., Li, Z., and Chen, C. (2017): Global potential of rare earth resources and rare



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earth demand from clean technologies, *Minerals*, 7(11).
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