

## DAFTAR PUSTAKA

- [1]“Badan Pengawas Tenaga Nuklir - Penguatan Kerja Sama Indonesia dan IAEA dalam bidang Dekomisioning Fasilitas Nuklir.” Accessed: Sept. 20, 2025. [Online]. Available: <https://www.bapeten.go.id/berita/pengembangan-kerjasama-indonesiaiaea-dalam-bidang-dekomisioning-130732#>
- [2]“Undang-Undang Republik Indonesia Nomor 10 Tahun 1997 tentang Ketenaganukliran”.
- [3]W. Wati *et al.*, “Pengolahan Limbah Radioaktif Cair Aktivitas Tinggi Melalui Vitrifikasi Gelas Borosilikat,” *Urania J. Ilm. Daur Bahan Bakar Nukl.*, vol. 30, Dec. 2024, doi: 10.55981/urania.2024.9144.
- [4]Internationale Atomenergie-Organisation, Ed., *Spent fuel and high level waste: chemical durability and performance under simulated repository conditions: results of a coordinated research project 1998-2004 ; additional information.* in IAEA-TECDOC Companion CD, no. 1563. Vienna: IAEA, 2007.
- [5] Y. Kiriya, T. Furuya, and O. Kato, “Characteristics of potential borosilicate glass compositions for high-level waste solidification in several countries,” Japan Atomic Energy Research Inst., JAERI-M--8915, 1980. Accessed: Sept. 22, 2025. [Online]. Available: [http://inis-temp.iaea.org/Search/search.aspx?orig\\_q=RN:12596862](http://inis-temp.iaea.org/Search/search.aspx?orig_q=RN:12596862).
- [6]A. Aisyah, “Pemanfaatan Abu Layang sebagai Bahan Pembentuk Gelas pada Vitrifikasi Limbah Cair Tingkat Tinggi,” *J. Teknol. Pengelolaan Limbah*, vol. 17, no. 2, p. 219579, 2015.
- [7]D. Dhaneswara, J. F. Fatriansyah, F. W. Situmorang, and A. N. Haqoh, “Synthesis of Amorphous Silica from Rice Husk Ash: Comparing HCl and CH<sub>3</sub>COOH Acidification Methods and Various Alkaline Concentrations,” *Int. J. Technol.*, vol. 11, no. 1, p. 200, Jan. 2020, doi: 10.14716/ijtech.v11i1.3335.



- [8] B. P. S. Indonesia, "Luas Panen, Produksi, dan Produktivitas Padi Menurut Provinsi - Tabel Statistik." Accessed: Apr. 28, 2025. [Online]. Available: <https://www.bps.go.id/id/statistics-table/2/MTQ5OCMy/luas-panen--produksi--dan-produktivitas-padi-menurut-provinsi.html>
- [9] Sapei, K. S. Padmawijaya, A. Sutejo, and L. Theresia, "Karakterisasi silika sekam padi dengan variasi temperatur leaching menggunakan asam asetat," *Jurnal Teknik Kimia*, vol. 9, no. 2, pp. 38–43, 2015.
- [10] Candra, S. P. Sari, R. T. Putri, Wulandari, and V. A. Fabiani, "Ekstraksi dan Karakterisasi Silika dari Sekam Padi Asal Bangka," *Pros. Semin. Nas. Sains Dan Terap.*, vol. 1, no. 1, pp. 78–81, Dec. 2023.
- [11] L. Sapei, K. S. Padmawijaya, and A. Sutejo, "Karakterisasi Silika Sekam Padi dengan Variasi Temperatur Leaching Menggunakan Asam Asetat," vol. 9, no. 2, 2015.
- [12] G. F. Agung M, M. R. Hanafie Sy, and P. Mardina, "Ekstraksi Silika dari Abu Sekam Padi dengan Pelarut KOH," *Konversi*, vol. 2, no. 1, p. 28, Apr. 2013, doi: 10.20527/k.v2i1.125.
- [13] M. Meliyana, C. Rahmawati, and L. Handayani, "Sintesis Silika Dari Abu Sekam Padi Dan Pengaruhnya Terhadap Karakteristik Bata Ringan," *Elkawnie*, vol. 5, no. 2, p. 164, Dec. 2019, doi: 10.22373/ekw.v5i2.5533.
- [14] R. Tahir, S. E. Widiyanti, I. Katu, and N. N. Idar, "Ekstraksi dan Analisis Karakteristik Silika dari Sekam Padi," in *Proc. 5th Seminar Nasional Penelitian & Pengabdian kepada Masyarakat*, 2021, ISBN 978-623-98762-1-0.
- [15] A. Alhodaib, O. Ibrahim, S. Abd El All, and F. Ezzeldin, "Effect of Rare-Earth Ions on the Optical and PL Properties of Novel Borosilicate Glass Developed from Agricultural Waste," *Materials*, vol. 14, no. 19, p. 5607, Sept. 2021, doi: 10.3390/ma14195607.



- [16] Sawasdee Vanatpornratt and Pisutpaisal Nipon, “Rice Husk Ash Characterization and Utilization as a source of Silica Material,” *Chem. Eng. Trans.*, vol. 93, pp. 79–84, July 2022, doi: 10.3303/CET2293014.
- [15] I. Pratomo, S. Wardhani, and D. Purwonugroho, “Pengaruh Teknik Ekstraksi dan Konsentrasi Hcl dalam Ekstraksi Silika dari Sekam Padi untuk Sintesis Silika Xerogel,” *Journal:eArticle*, Brawijaya University, 2013. Accessed: Sept. 22, 2025. [Online]. Available: <https://www.neliti.com/publications/246511/>.
- [18] A. Chandra, Y. A. Miryanti, L. B. Widjaja, and A. Pramudita, “ISOLASI DAN KARAKTERISASI SILIKA DARI SEKAM PADI,” *Res. Rep. - Eng. Sci.*, vol. 2, 2012, doi: 10.26593/rres.V2i0.170.%25p.
- [19] S. Steven, E. Restiawaty, P. Pasymi, and Y. Bindar, “An appropriate acid leaching sequence in rice husk ash extraction to enhance the produced green silica quality for sustainable industrial silica gel purpose,” *J. Taiwan Inst. Chem. Eng.*, vol. 122, pp. 51–57, May 2021, doi: 10.1016/j.jtice.2021.04.053.
- [20] U. J. Alengaram, “2 - Valorization of industrial byproducts and wastes as sustainable construction materials,” in *Handbook of Sustainable Concrete and Industrial Waste Management*, F. Colangelo, R. Cioffi, and I. Farina, Eds., in Woodhead Publishing Series in Civil and Structural Engineering. , Woodhead Publishing, 2022, pp. 23–43. doi: 10.1016/B978-0-12-821730-6.00003-6.
- [21] E. Aprianti S, “A huge number of artificial waste material can be supplementary cementitious material (SCM) for concrete production – a review part II,” *J. Clean. Prod.*, vol. 142, pp. 4178–4194, Jan. 2017, doi: 10.1016/j.jclepro.2015.12.115.
- [22] M. F. M. Zain, M. N. Islam, F. Mahmud, and M. Jamil, “Production of rice husk ash for use in concrete as a supplementary cementitious material,” *Constr. Build. Mater.*, vol. 25, no. 2, pp. 798–805, Feb. 2011, doi: 10.1016/j.conbuildmat.2010.07.003.



- [23] M. R. F. Gonçaves and C. P. Bergmann, “Thermal insulators made with rice husk ashes: Production and correlation between properties and microstructure,” *Constr. Build. Mater.*, vol. 21, no. 12, pp. 2059–2065, Dec. 2007, doi: 10.1016/j.conbuildmat.2006.05.057.
- [24] R. Anrozi and Y. Trihadiningrum, “Kajian Teknologi dan Mekanisme Stabilisasi/Solidifikasi untuk Pengolahan Limbah B3,” *J. Tek. ITS*, vol. 6, no. 2, pp. F445–F450, Sept. 2017, doi: 10.12962/j23373539.v6i2.25134.
- [25] Y. Zou and T. Yang, “Rice Husk, Rice Husk Ash and Their Applications,” in *Rice Bran and Rice Bran Oil*, Elsevier, 2019, pp. 207–246. doi: 10.1016/B978-0-12-812828-2.00009-3.
- [26] S. Bahri and Z. Ginting, “Pengaruh Suhu dan Waktu Pembakaran terhadap Kadar Silika dari Abu Sekam Padi,” 2022.
- [27] W. O. Sartifa, L. Harimu, and W. O. Mulyana, “Variasi Konsentrasi Asam Klorida (HCl) dan Lama Perendaman Slag Nikel dalam Proses Leaching serta Variasi Volume NH<sub>4</sub>OH untuk Mengendapkan Besi (Fe),” *SAINS: Jurnal Ilmu Kimia dan Pendidikan Kimia*, vol. 11, no. 2, Dec. 2022. [Online]. Available: <http://ojs.uho.ac.id/index.php/SAINS> (accessed Oct. 17, 2025).
- [28] N. Blessing, “Investigating the effect of concentration on the rate of reaction between Magnesium and Hydrochloric acid,” 2024, doi: 10.13140/RG.2.2.11303.97444.
- [29] I. Pratomo, S. Wardhani, and D. Purwonugroho, “Pengaruh Teknik Ekstraksi dan Konsentrasi Hcl dalam Ekstraksi Silika dari Sekam Padi untuk Sintesis Silika Xerogel,” *Journal:eArticle*, Brawijaya University, 2013. Accessed: Sept. 22, 2025. [Online]. Available: <https://www.neliti.com/publications/246511/>
- [30] W. Duan, D. Wang, Z. Wang, and Q. Yu, “Hydrometallurgical Leaching Behavior and Kinetic Modeling of Blast Furnace Slag in Hydrochloric Acid,”



- J. Sustain. Metall.*, vol. 8, no. 1, pp. 170–185, Mar. 2022, doi: 10.1007/s40831-021-00473-w.
- [31] J. Xiang, Q. Huang, X. Lv, and C. Bai, “Extraction of vanadium from converter slag by two-step sulfuric acid leaching process,” *J. Clean. Prod.*, vol. 170, pp. 1089–1101, Jan. 2018, doi: 10.1016/j.jclepro.2017.09.255.
- [32] D. R. Mujiyanti, D. Ariyani, and N. Paujiah, “Kajian Variasi Konsentrasi NaOH dalam Ekstraksi Silika dari Limbah Sekam Padi Banjar Jenis ‘Pandak,’” *J. Sains Dan Terap. Kim.*, vol. 15, no. 2, p. 143, Aug. 2021, doi: 10.20527/jstk.v15i2.10373.
- [33] N. N. Ngoc, L. X. Thanh, L. T. Vinh, and B. T. Van Anh, “High-purity amorphous silica from rice husk: Preparation and characterization,” *Vietnam J. Chem.*, vol. 56, no. 6, pp. 730–736, Dec. 2018, doi: 10.1002/vjch.201800079.
- [34] A. Townshend, “TITRIMETRY | Overview,” in *Encyclopedia of Analytical Science (Second Edition)*, P. Worsfold, A. Townshend, and C. Poole, Eds., Oxford: Elsevier, 2005, pp. 105–113. doi: 10.1016/B0-12-369397-7/00625-7.
- [35] N. Setyawan, Hoerudin, and S. Yuliani, “Synthesis of silica from rice husk by sol-gel method,” *IOP Conf. Ser. Earth Environ. Sci.*, vol. 733, no. 1, p. 012149, Apr. 2021, doi: 10.1088/1755-1315/733/1/012149.
- [36] G. Elsandika, M. Dirgantara, S. U. M. Beladona, and M. H. Pasaribu, “Sintesis dan Karakterisasi Silika Sekam Padi sebagai Material Self-Cleaning,” *J. Fis. Unand*, vol. 14, no. 2, pp. 124–130, Mar. 2025, doi: 10.25077/jfu.14.2.124-130.2025.
- [37] A. Cordoba, J. V. Cauich-Rodríguez, R. F. Vargas-Coronado, R. Velázquez-Castillo, and K. Esquivel, “A Novel In Situ Sol-Gel Synthesis Method for PDMS Composites Reinforced with Silica Nanoparticles,” *Polymers*, vol. 16, no. 8, p. 1125, Apr. 2024, doi: 10.3390/polym16081125.



- [38] Z. Wang, L. Hu, Y. Liu, and S. Hu, “Effects of instrumental configuration, sample preparation, and pretreatment on the IR spectra of silicalite-1,” Aug. 25, 2023, *In Review*. doi: 10.21203/rs.3.rs-3284802/v1.
- [39] “Powder Characterization and Testing,” in *Handbook of Non-Ferrous Metal Powders*, Elsevier, 2019, pp. 3–62. doi: 10.1016/b978-0-08-100543-9.00001-4.
- [40] R. Groarke, R. Vijayaraghavan, D. Powell, A. Rennie, and D. Brabazon, “Powder characterization—methods, standards, and state of the art,” 2021, pp. 491–527. doi: 10.1016/B978-0-12-824090-8.00006-8.
- [41] Aisyah, “Devitrifikasi gelas limbah dan korosi canister dalam storage dan disposal limbah radioaktif,” *J. Teknol. Pengelolaan Limbah (Journal of Waste Management Technology)*, vol. 17, no. 1, pp. 1–13, Jul. 2014.
- [42] H. Martono, “Glass frit dan polimer untuk solidifikasi limbah cair aktivitas rendah skala industri,” in *Proc. Semin. Nas. Teknol. Pengelolaan Limbah (SNTPL) IX, Pusat Teknologi Limbah Radioaktif–BATAN & Fakultas Teknik, Universitas Sultan Ageng Tirtayasa, Serang, Indonesia, [tahun]*, ISSN 1410-6086.
- [43] N. Çöpoğlu, H. Gökdemir, T. Cengiz, and B. Çiçek, “Barium borosilicate glass coatings based on biomass for steel surfaces: Use of rice husk ash,” *Ceram. Int.*, vol. 48, no. 6, pp. 8671–8679, Mar. 2022, doi: 10.1016/j.ceramint.2021.12.078.
- [44] C. M. Jantzen, W. E. Lee, and M. I. Ojovan, “Radioactive waste (RAW) conditioning, immobilization, and encapsulation processes and technologies: overview and advances,” in *Radioactive Waste Management and Contaminated Site Clean-Up*, Elsevier, 2013, pp. 171–272. doi: 10.1533/9780857097446.1.171.
- [45] H. Martono and Y. Purwanto, “Devitrifikasi gelas-limbah dari abu batubara pada berbagai suhu dan waktu pemanasan,” in *Proc. Semin. Nas. Teknol.*



Pengelolaan Limbah (SNTPL) XII, Pusat Teknologi Limbah Radioaktif—  
BATAN, Serpong, Indonesia, ISSN 1410-6086.

- [46] S. L. C. Ferreira *et al.*, “Box-Behnken design: An alternative for the optimization of analytical methods,” *Anal. Chim. Acta*, vol. 597, no. 2, pp. 179–186, Aug. 2007, doi: 10.1016/j.aca.2007.07.011.
- [47] Y. T. Zewide *et al.*, “Application of response surface methodology (RSM) for experimental optimization in biogenic silica extraction from rice husk and straw ash,” *Sci. Rep.*, vol. 15, no. 1, p. 132, Jan. 2025, doi: 10.1038/s41598-024-83724-6.
- [48] H. Kurama, “The effect of chemical treatment on the production of active silica from rice husk,” ... *Min. Congr. Exhib. Turk.- ...*, Jan. 2003, Accessed: Oct. 17, 2025. [Online]. Available: [https://www.academia.edu/27235586/The\\_effect\\_of\\_chemical\\_treatment\\_on\\_the\\_production\\_of\\_active\\_silica\\_from\\_rice\\_husk](https://www.academia.edu/27235586/The_effect_of_chemical_treatment_on_the_production_of_active_silica_from_rice_husk)
- [49] A. Malau, N. Halizah, G. Pasaribu, H. L. Wijayanto, and Ardiansah, “Pengaruh Konsentrasi Pelarut Asam (HNO<sub>3</sub> dan CH<sub>3</sub>COOH) dan Temperatur Terhadap Persen Recovery Nikel Dari Hasil Leaching Bijih Laterit Morowali,” *J. Sci. Mandalika JSM E-ISSN 2745-5955 P-ISSN 2809-0543*, vol. 6, no. 8, pp. 3367–3374, May 2025, doi: 10.36312/10.36312/vol6iss8pp3367-3374.
- [50] D. Dhaneswara, J. F. Fatriansyah, F. W. Situmorang, and A. N. Haqoh, “Synthesis of Amorphous Silica from Rice Husk Ash: Comparing HCl and CH<sub>3</sub>COOH Acidification Methods and Various Alkaline Concentrations,” *Int. J. Technol.*, vol. 11, no. 1, p. 200, Jan. 2020, doi: 10.14716/ijtech.v11i1.3335.
- [51] D. R. Mujiyanti, D. Ariyani, and M. Lisa, “Silica content analysis of Siam Unus rice husks from South Kalimantan,” *Indonesian Journal of Chemical Research*, vol. 9, no. 2, pp. 81–87, 2021.



- [52] J. Pusvitasari, P. Manurung, and P. Karo-Karo, “Pengaruh variasi HCl pada pemurnian silika berbasis batu apung,” *Jurnal Teori dan Aplikasi Fisika*, vol. 6, no. 1, Jan. 2018.
- [53] U. Kalapathy, A. Proctor, and J. Shultz, “An improved method for production of silica from rice hull ash,” *Bioresour. Technol.*, vol. 85, no. 3, pp. 285–289, Dec. 2002, doi: 10.1016/S0960-8524(02)00116-5.
- [54] R. Thahir, S. E. Widiyanti, and I. Katu, “Ekstraksi dan Analisis Karakteristik Silika dari Sekam Padi,” 2021.
- [53] Amin, M., Sumardi, S., Marjunus, R., Clarasati, F., Candra, D. B., Muttaqi, M. A., Is Nugroho, K., & Hendronursito, “Processing of granite quarry solid waste into industrial high silica materials using leaching process with HCl concentration variation,” *J. Ris. Teknol. Pencegah. Pencemaran Ind.*, vol. 11, no. 2, pp. 43–50, Nov. 2020, doi: 10.21771/jrtpi.2020.v11.no2.p43-50.
- [56] R. A. Ramadhani, D. H. S. Riyadi, B. Triwibowo, and R. D. Kusumaningtyas, “Review Pemanfaatan Design Expert untuk Optimasi Komposisi Campuran Minyak Nabati sebagai Bahan Baku Sintesis Biodiesel,” *J. Tek. Kim. Dan Lingkung.*, vol. 1, no. 1, pp. 11–16, Oct. 2017, doi: 10.33795/jtkl.v1i1.5.
- [57] “Memahami Nilai Standard Deviation (Standar Deviasi) dalam Penelitian Ilmiah.” Accessed: Oct. 02, 2025. [Online]. Available: <https://accounting.binus.ac.id/2021/08/12/memahami-nilai-standard-deviation-standar-deviasi-dalam-penelitian-ilmiah/>

