

DAFTAR PUSTAKA

- [1] Z. Duan *et al.*, ‘Overview of performances and service behaviors of uranyl nitrate solution for medical aqueous homogeneous reactors’, *Progress in Nuclear Energy*, vol. 157, p. 104591, Mar. 2023, doi: 10.1016/j.pnucene.2023.104591.
- [2] P. H. Liem, H. N. Tran, and T. M. Sembiring, ‘Design optimization of a new homogeneous reactor for medical radioisotope $^{99}\text{Mo}/\text{Tc-99m}$ production’, *Progress in Nuclear Energy*, vol. 82, pp. 191–196, Jul. 2015, doi: 10.1016/j.pnucene.2014.07.040.
- [3] N. R. Hidayati, ‘Application Of $^{99\text{m}}\text{Tc}$ Radioisotope In Diagnostic Procedures And Internal Radiation Dose Estimation’, in *KnE Energy*, Sep. 2016. doi: 10.18502/ken.v1i1.469.
- [4] ‘The use of nuclear medicine diagnostics and Tc-99m varies significantly across countries’, OECD. Accessed: May 07, 2025. [Online]. Available: https://www.oecd.org/en/publications/the-supply-of-medical-isotopes_9b326195-en/full-report/the-use-of-nuclear-medicine-diagnostics-and-tc-99m-varies-significantly-across-countries_f169821d.html
- [5] ‘The Security of Supply of Medical Radioisotopes: Demand and Capacity Projections for $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$ for the 2023-2027 Period’, Nuclear Energy Agency (NEA). Accessed: May 07, 2025. [Online]. Available: https://www.oecd-nea.org/jcms/pl_87477/the-security-of-supply-of-medical-radioisotopes-demand-and-capacity-projections-for-99mo/99mtc-for-the-2023-2027-period?details=true
- [6] ‘The Tc-99m supply chain is technically complex and characterised by market imperfections’, OECD. Accessed: May 07, 2025. [Online]. Available: https://www.oecd.org/en/publications/the-supply-of-medical-isotopes_9b326195-en/full-report/the-tc-99m-supply-chain-is-technically-complex-and-characterised-by-market-imperfections_6fa7875d.html



- [7] B. Ferrucci, G. Ottaviano, A. Rizzo, and A. Ubaldini, ‘Future development of global molybdenum-99 production and saving of atmospheric radioxenon emissions by using nuclear fusion-based approaches’, *Journal of Environmental Radioactivity*, vol. 255, p. 107049, Dec. 2022, doi: 10.1016/j.jenvrad.2022.107049.
- [8] S. J. Kim, M. R. Naranjo, and R. B. Wilkerson, ‘The ARGUS Solution Reactor and Molybdenum Production: A Summary Report Based on Open Literature’, Los Alamos National Laboratory (LANL), Los Alamos, NM (United States), LA-UR-18-29657, Oct. 2018. doi: 10.2172/1477623.
- [9] M. Khan and Q. Mahmood, ‘Nucleus Technetium-99 m Radiopharmaceuticals : A Review on Basic and Applied Aspects’, 2020. Accessed: May 09, 2025. [Online]. Available: https://www.semanticscholar.org/paper/Nucleus-Technetium-99-m-Radiopharmaceuticals-%3A-A-on-Khan-Mahmood/dfa898cb43d972a7e0f7947705d24f1bd759126a?utm_source=consensus
- [10] J. Jang, S. Sekimoto, T. Ohtsuki, K. Tatenuma, A. Tsuguchi, and M. Uesaka, ‘A quantitative description of the compatibility of technetium-selective chromatographic technetium-99m separation with low specific activity molybdenum-99’, *Journal of Chromatography A*, vol. 1705, p. 464192, Aug. 2023, doi: 10.1016/j.chroma.2023.464192.
- [11] A. W. Harto, A. Agung, M. Y. A. Putra, R. A. Azizi, and R. A. P. Dwijayanto, ‘Neutronic characteristics of the GAMA aqueous homogeneous reactor (GAMA-AHR)’, *Nuclear Engineering and Design*, vol. 424, p. 113311, Aug. 2024, doi: 10.1016/j.nucengdes.2024.113311.
- [12] PACIFIC NORTHWEST NATIONAL LABORATORY, ‘Data Mining Analysis and Modeling Cell: Compendium of Material Composition Data for Radiation Transport Modeling’, UNITED STATES DEPARTMENT OF ENERGY, 200-DMAMC-128170, Apr. 2021.



- [13] B. Jandaghian, M. H. Choopan Dastjerdi, and J. Mokhtari, 'Characterization of neutronic parameters and radiation shielding design for an aqueous homogeneous reactor', *Nuclear Engineering and Design*, vol. 417, p. 112832, Feb. 2024, doi: 10.1016/j.nucengdes.2023.112832.
- [14] A. Hamzah, Suwoto, and H. Adrial, 'Preliminary analysis of dose rates distribution of experimental power reactor 10 MW using MCNP', *J. Phys.: Conf. Ser.*, vol. 1198, no. 2, p. 022038, Apr. 2019, doi: 10.1088/1742-6596/1198/2/022038.
- [15] R. L. Oméga, S. Permana, R. H. Oetami, and Rasito, 'Assessment of Gamma and Neutron Dose of Optimizing the Radiation Protection in TRIGA 2000 BATAN Bandung.', *J. Phys.: Conf. Ser.*, vol. 1493, no. 1, p. 012011, Mar. 2020, doi: 10.1088/1742-6596/1493/1/012011.
- [16] H. Khodadadi and N. Ayoobian, 'Conceptual design and uncertainty analysis of a typical 50 kW aqueous homogeneous reactor aimed for medical isotope production', *Progress in Nuclear Energy*, vol. 121, p. 103233, Mar. 2020, doi: 10.1016/j.pnucene.2019.103233.
- [17] I. A. E. Agency, 'Homogeneous Aqueous Solution Nuclear Reactors for the Production of ^{99}Mo and other Short Lived Radioisotopes', International Atomic Energy Agency, Text, 2008. Accessed: Feb. 27, 2025. [Online]. Available: [https://www.iaea.org/publications/7994/homogeneous-aqueous-solution-nuclear-reactors-for-the-production-of- \$^{99}\text{Mo}\$ -and-other-short-lived-radioisotopes](https://www.iaea.org/publications/7994/homogeneous-aqueous-solution-nuclear-reactors-for-the-production-of-⁹⁹Mo-and-other-short-lived-radioisotopes)
- [18] 'The 2007 Recommendations of the International Commission on Radiological Protection. ICRP publication 103', *Ann ICRP*, vol. 37, no. 2–4, pp. 1–332, 2007, doi: 10.1016/j.icrp.2007.10.003.
- [19] W. R. Hendee and F. Marc Edwards, 'ALARA and an integrated approach to radiation protection', *Seminars in Nuclear Medicine*, vol. 16, no. 2, pp. 142–150, Apr. 1986, doi: 10.1016/S0001-2998(86)80027-7.



- [20] A. W. K. Yeung, 'The "As Low As Reasonably Achievable" (ALARA) principle: a brief historical overview and a bibliometric analysis of the most cited publications', *Radioprotection*, vol. 54, no. 2, pp. 103–109, Apr. 2019, doi: 10.1051/radiopro/2019016.
- [21] B. P. T. Nuklir, 'Peraturan Kepala Badan Pengawas Tenaga Nuklir Nomor 4 Tahun 2013 tentang Proteksi dan Keselamatan Radiasi dalam Pemanfaatan Tenaga Nuklir', *Republik Indones*, 2013.
- [22] Y. Zuo, J. Zhu, S. Niu, P. Shang, and H. Xie, 'Simulation of neutron shielding performance of concrete material in different incident directions', *IOP Conf. Ser.: Mater. Sci. Eng.*, vol. 490, no. 2, p. 022014, Apr. 2019, doi: 10.1088/1757-899X/490/2/022014.
- [23] N. Tsoulfanidis and S. Landsberger, *Measurement and detection of radiation*. CRC press, 2021.
- [24] W. A. Wardhana, 'Teknologi Nuklir: Proteksi Radiasi dan Aplikasinya', *Andi Yogyakarta, h*, vol. 155, 2007.
- [25] T. Kamae, R. Enomoto, and N. Hanada, 'A new method to measure energy, direction, and polarization of gamma rays', *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, vol. 260, no. 1, pp. 254–257, Oct. 1987, doi: 10.1016/0168-9002(87)90410-4.
- [26] W. R. Leo, 'Passage of Radiation Through Matter', in *Techniques for Nuclear and Particle Physics Experiments: A How-to Approach*, W. R. Leo, Ed., Berlin, Heidelberg: Springer, 1994, pp. 17–68. doi: 10.1007/978-3-642-57920-2_2.
- [27] G. F. Knoll, *Radiation detection and measurement*. John Wiley & Sons, 2010.
- [28] 'NEUTRON CROSS SECTIONS', Elsevier, 1988, p. ii. doi: 10.1016/B978-0-12-484220-5.50001-0.



- [29] E. E. Lewis, *Fundamentals of nuclear reactor physics*. Elsevier, 2008.
- [30] J. R. Lamarsh, *Introduction to nuclear engineering*. Addison-Wesley Publishing Co., Reading, MA, 1975.
- [31] S. H. Park and J. O. Kang, ‘Basics of particle therapy I: physics’, *Radiat Oncol J*, vol. 29, no. 3, pp. 135–146, Sep. 2011, doi: 10.3857/roj.2011.29.3.135.
- [32] T. Sato, Y. Iwamoto, S. Hashimoto, T. Ogawa, T. Furuta, S. I. Abe, T. Kai, Y. Matsuya, N. Matsuda, Y. Hirata, T. Sekikawa, L. Yao, P. E. Tsai, H. N. Ratliff, H. Iwase, Y. Sakaki, K. Sugihara, N. Shigyo, L. Shiver, and K. Niita, ‘Recent improvements of the particle and heavy ion transport code system – PHITS version 3.33’, *Journal of Nuclear Science and Technology*, vol. 61, no. 1, pp. 127–135, Jan. 2024, doi: 10.1080/00223131.2023.2275736.
- [33] N. Iwamoto, S. Kunieda, F. Minato, S. Nakayama, Y. Abe, K. Tsubakihara, S. Okumura, C. Ishizuka, T. Yoshida, S. Chiba, N. Otuka, J. C. Sublet, H. Iwamoto, K. Yamamoto, Y. Nagaya, K. Tada, C. Konno, N. Matsuda, K. Yokoyama, H. Taninaka, A. Oizumi, M. Fukushima, S. Okita, G. Chiba, S. Sato, M. Ohta, and S. Kwon, ‘Japanese evaluated nuclear data library version 5: JENDL-5’, *Journal of Nuclear Science and Technology*, Jan. 2023, Accessed: Apr. 16, 2025. [Online]. Available: <https://www.tandfonline.com/doi/abs/10.1080/00223131.2022.214190>.
- [34] Y. Iwamoto, T. Sato, S. Hashimoto, T. Ogawa, T. Furuta, S. I. Abe, T. Kai, N. Matsuda, R. Hosoyamada, and K. Niita, ‘Benchmark study of the recent version of the PHITS code’, *Journal of Nuclear Science and Technology*, vol. 54, no. 5, pp. 617–635, May 2017, doi: 10.1080/00223131.2017.1297742.
- [35] J. A. E. Agency, *PHITS User’s Manual Ver. 3.34*. 2019.
- [36] ‘JANIS’. Accessed: Apr. 25, 2025. [Online]. Available: <https://www.oecd-neo.org/janisweb/tree/RDD/'ENDF/B-VIII.0'/RDD>



- [37] E. E. Davidson (née Sunny), B. R. Betzler, D. Chandler, and G. Ilas, ‘Heat deposition analysis for the High Flux Isotope Reactor’s HEU and LEU core models’, *Nuclear Engineering and Design*, vol. 322, pp. 563–576, Oct. 2017, doi: 10.1016/j.nucengdes.2017.06.040.
- [38] S. Glass Tone and A. Sesonske, ‘Nuclear Reactor Engineering (ThirdEdition)’, pp. 71–74, 1981, doi: . <https://doi.org/10.13182/NT82-A32943>.
- [39] J. P. Chung *et al.*, ‘Development of a PMMA phantom as a practical alternative for quality control of gamma knife® dosimetry’, *Radiat Oncol*, vol. 13, no. 1, p. 176, Dec. 2018, doi: 10.1186/s13014-018-1117-8.
- [40] V. Kishore, L. Kumar, M. Bhushan, and G. Yadav, ‘A study for the development of a low density heterogeneous phantom for dose verification in high energy photon beam’, *Radiation Physics and Chemistry*, vol. 170, p. 108638, May 2020, doi: 10.1016/j.radphyschem.2019.108638.
- [41] V. Bernardo, J. Martin-de Leon, J. Pinto, T. Catelani, A. Athanassiou, and M. A. Rodriguez-Perez, ‘Low-density PMMA/MAM nanocellular polymers using low MAM contents: Production and characterization’, *Polymer*, vol. 163, pp. 115–124, Feb. 2019, doi: 10.1016/j.polymer.2018.12.057.
- [42] A. Khallouqi, A. Halimi, and O. E. Rhazouani, ‘Evaluating polyester resin as a viable substitute for PMMA in computed tomography dosimetry phantoms’, *Nuclear Engineering and Technology*, 2024, doi: 10.1016/j.net.2024.04.024.
- [43] I. Singh, B. Singh, B. S. Sandhu, and A. D. Sabharwal, ‘Investigations of various gamma radiation interaction parameters of human tissues and their tissue substitute materials for dosimetric applications’, *Radiation Physics and Chemistry*, vol. 189, p. 109742, Dec. 2021, doi: 10.1016/j.radphyschem.2021.109742.
- [44] C. M. Lund, G. Famulari, L. Montgomery, and J. Kildea, ‘A microdosimetric analysis of the interactions of mono-energetic neutrons with human tissue’,



Physica Medica, vol. 73, pp. 29–42, May 2020, doi: 10.1016/j.ejmp.2020.04.001.

- [45] D. L. Stricklin, J. VanHorne-Sealy, C. I. Rios, L. A. Scott Carnell, and L. P. Taliaferro, ‘Neutron Radiobiology and Dosimetry’, *Radiation Research*, vol. 195, no. 5, Apr. 2021, doi: 10.1667/RADE-20-00213.1.
- [46] G. Zhang, M. Fratoni, and E. Greenspan, ‘Improved resource utilization by advanced burner reactors with breed-and-burn blankets’, *Progress in Nuclear Energy*, vol. 106, pp. 440–454, Jul. 2018, doi: 10.1016/j.pnucene.2018.03.020.
- [47] V. Jagannathan, A. Mathur, and S. A. Khan, ‘Thorium utilization in existing and advanced reactor types’, *International Journal of Hydrogen Energy*, vol. 41, no. 17, pp. 7094–7102, May 2016, doi: 10.1016/j.ijhydene.2015.12.035.
- [48] I. A. E. Agency, ‘International Basic Safety Standards for Protection Against Ionizing Radiation and for the Safety of Radiation Sources (CD-ROM Edition, 2003)’, International Atomic Energy Agency, Text, 2003. Accessed: Feb. 27, 2025. [Online]. Available: <https://www.iaea.org/publications/6900/international-basic-safety-standards-for-protection-against-ionizing-radiation-and-for-the-safety-of-radiation-sources-cd-rom-edition-2003>

