

DAFTAR PUSTAKA

- AbuAlRoos, N. J., Amin, N. A. B., & Zainon, R. (2019). Conventional and new lead-free radiation shielding materials for radiation protection in nuclear medicine: A review. *Radiation Physics and Chemistry*, 165, 108439. <https://doi.org/10.1016/j.radphyschem.2019.108439>
- Ahmed, S. N. (2007). *Physics and engineering of radiation detection*. Academic Press.
- Akça, B., Gürbulak, B., & Erzeneoğlu, S. Z. (2021). Effect of voltages on γ -ray linear attenuation coefficients for some semiconductors. *Radiation Physics and Chemistry*, 179, 109208. <https://doi.org/10.1016/j.radphyschem.2020.109208>
- Alavian, H., & Tavakoli-Anbaran, H. (2019). Study on gamma shielding polymer composites reinforced with different sizes and proportions of tungsten particles using MCNP code. *Progress in Nuclear Energy*, 115, 91–98. <https://doi.org/10.1016/j.pnucene.2019.03.033>
- Alghamdi, S. A. (2025). Patients' knowledge and perceptions of ionizing radiation from medical imaging in Saudi Arabia. *Journal of Radiation Research and Applied Sciences*, 18(1), 101803. <https://doi.org/10.1016/j.jrras.2024.101803>
- Almutery, A., Rahman, W. N., Mohamed, F., Hua, C. C., Razak, K. A., Rashid, R. A., Rilwan, U., Sayyed, M. I., & Maghrbi, Y. (2025). Enhancing the gamma radiation shielding performance: The impact of Bi₂O₃ and MgO nanoparticles on PMMA. *Radiation Physics and Chemistry*, 237, 113070. <https://doi.org/10.1016/j.radphyschem.2025.113070>
- Al-Muttairi, A. K., & Kabir, N. A. (2026). Polyvinyl alcohol composites (PVA) with added Pb, Bi, and Sn: A study on radiation shielding and gamma ray attenuation. *Nuclear Analysis*, 5, 100203. <https://doi.org/10.1016/j.nucana.2025.100203>
- Azlan, M., Sukaryo, S. G., Ardiansyah, A., Abdullah, B., Armynah, B., Gareso, P. L., Karim, M. K. A., & Tahir, D. (2025). Sustainable development of PVA/cellulose/PALF-based composites coated with nano-BaCO₃ for enhanced X-ray radiation shielding aprons. *International Journal of Biological Macromolecules*, 332, 148699. <https://doi.org/10.1016/j.ijbiomac.2025.148699>
- Bakri, F., Gareso, P. L., Alomari, A. H., Heryanto, H., Ardiansyah, A., Syarifuddin, S., Karim, M. K. A., Taufiq, A., & Tahir, D. (2025). Polyvinyl and bismuth Nitrite based apron (PVABIN-Apron): Fabrication and characterization. *Annals of Nuclear Energy*, 218, 111446. <https://doi.org/10.1016/j.anucene.2024.111446>

- Callister, W. D. (2007). *Materials Science and Engineering: An Introduction* (7th ed.). John Wiley & Sons, Inc.
- Chang, L., Zhang, Y., Liu, Y., Fang, J., Luan, W., Yang, X., & Zhang, W. (2015). Preparation and characterization of tungsten/epoxy composites for γ -rays radiation shielding. *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms*, 356-357, 88–93. <https://doi.org/10.1016/j.nimb.2015.04.048>
- Darwesh, R., Sayyed, M. I., Al-Hadeethi, Y., Alasali, H. J., & Alotaibi, J. S. (2024). Improved radiation shielding properties of epoxy resin composites using Sb_2O_3 and Al_2O_3 nanoparticles additives. *Annals of Nuclear Energy*, 200, 110385. <https://doi.org/10.1016/j.anucene.2024.110385>
- Dong, M. G., Sayyed, M. I., Lakshminarayana, G., Ersundu, M. Ç., Ersundu, A. E., Nayar, P., & Mahdi, M. A. (2017). Investigation of gamma radiation shielding properties of lithium zinc bismuth borate glasses using XCOM program and MCNP5 code. *Journal of Non-Crystalline Solids*, 468, 12–16. <https://doi.org/10.1016/j.jnoncrysol.2017.04.018>
- Erkoyuncu, İ., Maro, F. Z., Yılmaz, M., Torun, T. R., Özdemir, H. G., Oğul, H., & Akman, F. (2026). A study on radiation shielding properties, secondary radiation and radiation damage for composites containing glass fiber/PEEK/gadolinium oxide. *Radiation Physics and Chemistry*, 239, 113248. <https://doi.org/10.1016/j.radphyschem.2025.113248>
- Hassanpour, M., Hassanpour, M., Khandaker, M. U., Faruque, M. R. I., Alshahrani, B., & Osman, H. (2023). An alternative method for calculation of half-value layers without the knowledge of attenuation coefficient. *Applied Radiation and Isotopes*, 199, 110910. <https://doi.org/10.1016/j.apradiso.2023.110910>
- Hayre, C. M., Bungay, H., & Jeffery, C. (2020). How effective are lead-rubber aprons in protecting radiosensitive organs from secondary ionizing radiation?. *Radiography*, 26(4), e264-e269. <https://doi.org/10.1016/j.radi.2020.03.010>
- Hosseini, M. A., Malekie, S., & Kazemi, F. (2022). Experimental evaluation of gamma radiation shielding characteristics of Polyvinyl Alcohol/Tungsten oxide composite: A comparison study of micro and nano sizes of the fillers. *Nuclear Inst. and Methods in Physics Research, A*, 1026, 166214. <https://doi.org/10.1016/j.nima.2021.166214>
- Jamil, M., Hazlan, M. H., Ramli, R. M., & Azman, N. Z. N. (2019). Study of electrospun PVA-based concentrations nanofibre filled with Bi_2O_3 or WO_3 as potential x-ray shielding material. *Radiation Physics and Chemistry*, 156, 272–282. <https://doi.org/10.1016/j.radphyschem.2018.11.018>

- Kaçal, M. R., Dilsiz, K., Akman, F., & Polat, H. (2021). Analysis of radiation attenuation properties for Polyester Li_2WO_4 composites. *Radiation Physics and Chemistry*, 179, 109257. <https://doi.org/10.1016/j.radphyschem.2020.109257>
- Karim, S. R., Ramzan, B., Pandey, A. K., Sharma, K., Ansari, G. F., & Ashiq, M. (2025). Lead-free WO_3 -doped TeO_2 -ZnO-CaO- B_2O_3 glass system: A sustainable approach for radiation shielding in medical diagnostics. *Ceramics International*. <https://doi.org/10.1016/j.ceramint.2025.06.027>
- Kazemi, F., Malekie, S., & Hosseini, M. A. (2019). A Monte Carlo Study on the Shielding Properties of a Novel Polyvinyl Alcohol (PVA)/ WO_3 Composite, Against Gamma Rays, Using the MCNPX Code. *Journal of Biomedical Physics and Engineering*, 9(4), 465-472. <https://doi.org/10.31661/jbpe.v0i0.1114>
- Khorami, M. T., & Salehi, Z. (2025). Calculation and comparison of mass attenuation coefficients of common lead-free radiation shields for diagnostic X-ray radiation. *Journal of Radiation Research and Applied Sciences*, 18(1), 101740. <https://doi.org/10.1016/j.jrras.2024.101740>
- Kırkbınar, M. (2026). Physical, chemical, mechanical and radiation shielding properties of ZrO_2 - B_2O_3 - SiO_2 based waste glass ceramics containing different Bi_2O_3 concentrations. *Radiation Physics and Chemistry*, 238, 113176. <https://doi.org/10.1016/j.radphyschem.2025.113176>
- Knoll, G. F. (2010). *Radiation detection and measurement* (4th ed.). John Wiley & Sons.
- More, C. V., Alsayed, Z., Badawi, M. S., Thabet, A. A., & Pawar, P. P. (2021). Polymeric composite materials for radiation shielding: a review. *Environmental Chemistry Letters*, 19(3), 2057-2090. <https://doi.org/10.1007/s10311-021-01189-9>
- Mourad, M. M., Sharshar, T., Elhussiny, F., Berber, M. R., Abdou, Y., & Badran, H. M. (2024). Structural, morphological, thermal, mechanical, positron annihilation, and γ shielding studies of nano-tungsten oxide/polyvinyl alcohol composites. *Chemical Physics*, 580, 112239. <https://doi.org/10.1016/j.chemphys.2024.112239>
- National Institute of Standards and Technology. (2026). *XCOM: Photon Cross Sections Database*. <https://physics.nist.gov/PhysRefData/Xcom/html/xcom1.html>
- Tekin, H. O., Kavaz, E., Papachristodoulou, A., Kamislioglu, M., Agar, O., Guclu, E. E. A., Kilicoglu, O., & Sayyed, M. I. (2019). Characterization of SiO_2 -PbO-CdO- Ga_2O_3 glasses for comprehensive nuclear shielding performance: Alpha, proton, gamma, neutron radiation. *Ceramics International*, 45(15), 19206–19222. <https://doi.org/10.1016/j.ceramint.2019.06.178>
- Thankachan, N., James, N. R., John, J. P., & Bijini, B. R. (2025). Experimental assessment of linear and mass attenuation coefficients of G-GAAB gel by

- narrow beam geometry with gamma rays and dual energy X-rays. *Radiation Physics and Chemistry*, 237, 113143. <https://doi.org/10.1016/j.radphyschem.2025.113143>
- Tiamduangtawan, P., Kamkaew, C., Kuntanwatchara, S., Wimolmala, E., & Saenboonruang, K. (2020). Comparative mechanical, self-healing, and gamma attenuation properties of PVA hydrogels containing either nano- or micro-sized Bi₂O₃ for use as gamma-shielding materials. *Radiation Physics and Chemistry*, 177, 109164. <https://doi.org/10.1016/j.radphyschem.2020.109164>
- Tonnessen, B. H., & Pounds, L. (2011). Radiation physics. *Journal of Vascular Surgery*, 53(1), 6S–8S. <https://doi.org/10.1016/j.jvs.2010.05.116>
- Urooge, S., Fazil, S., Irshad, A., Shahzad, K., Liaqat, K., Alam, F., Alam, M., Waris, M., & Hassan, R. (2026). Polyvinyl alcohol and polyvinylpyrrolidone composite incorporating bismuth nitrate for gamma ray shielding. *Radiation Physics and Chemistry*, 240, 113453. <https://doi.org/10.1016/j.radphyschem.2025.113453>.