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Abstract Collection

Lena Rosmayani, Anis Rohanda, Raden Farzand Abdullatif1., *A Simulation OF Irradiation Calculations on Lutetium-177 Production in RSG-GAS Using U3Si2-Al and U7MO-Al Fuels.*, Tri Dasa Mega, 25 (2), 45.

This research is a simulation of irradiation calculations on the production of the radioisotope Lutetium-177 (177Lu) in the G.A Siwabessy Reactor (RSG-GAS). This study aims to analyze the comparative calculation of 177Lu activity and its purity. One of the production methods of 177Lu in RSG-GAS is carried out by irradiating Lu2O3 targets. This Lu2O3 target irradiation produced the radioisotope 177Lu along with 177mLu as an impurity. For Medical treatment using radioisotopes, the minimum activity for 177Lu is 20 GBq/mg, and the impurity should not exceed 0.1%. Calculations were carried out with thermal neutron flux input at 15 MWt operational power for the RSG-GAS core with U3Si2-Al fuel (density 2.96 gU/cc and 3.55 gU/cc) and U9Mo-Al fuel (density 3.55 gU/cc). Calculations were carried out by simulating 8 days of irradiation using ORIGEN2.1. The results showed that the 177Lu activity resulting from irradiation of Lu2O3 targets at various CIP positions in the U9Mo-Al reactor core was larger than that of the U3Si2-Al core. Until the 30th day, the 177Lu product resulting from irradiation on the U3Si2-Al and U9Mo-Al cores still meets the minimum value of 20 GBq/mg for treatment needs in nuclear medicine, with the activity value of 177Lu resulting from irradiation on the U3Si2-Al core ranging from 241-403 GBq/mg, while the activity of irradiated 177Lu in the U9Mo-Al core ranges from 335-561 GBq/mg. In addition, until the 30th day of decay, 177Lu has a percentage value of 177mLu irradiated in the U9Mo-Al and U3Si2-Al cores of 0.0346% and 0.0344%, respectively. The results are still below the maximum impurity value of 0.1% and thus safe to use as a therapeutic agent.

Keywords: 177Lu, Activity, RSG-GAS, ORIGEN2, Irradiation.

Muhammad Ridho, Haryono Budi Santosa, Tukiran Surbakti, Purwadi Purwadi., *Neutronic Analysis of the RSG-GAS Fuel Using Burnable Poison.*, Tri Dasa Mega, 25 (2), 53.

Control and safety of nuclear reactors are significantly influenced by the determination of safety parameters. The three most crucial safety factors for assessing reactor status are the infinite multiplication factor, reactivity coefficients, and power peaking factor. The objective of the present study is to examine how the RSG-GAS fuel safety parameters behave in a typical reactor operation state. A lattice cell fuel model of the fuel lattice of the RSG-GAS reactor core was modeled using WIMSD-5B with cross-section library data based on ENDF/B-VIII.0. The value of the infinite multiplication factor with various burnable poison concentrations, as well as the moderator and fuel temperatures, were the variables that were examined. The reactivity coefficient parameters were similarly analyzed. By comparing the WIMSD-5B code results with information from the SAR document, the WIMS model for RSG-GAS fuel was verified, and it was inferred that the parameters are in good agreement. Safe behavior uses the predicted reactivity coefficient values as an example.

Keywords: Neutronic analysis, RSG-GAS fuel, Burnable poison, WIMSD-5 code, Lattice cell.

Theo Alvin Ryanto, Jupiter Sitorus Pane, Muhammad Budi Setiawan, Ihda Husnayani, Anik Purwaningsih, Hendro Tjahjono., *Preliminary Study on Implementing a Simplified Source Terms Estimation Program for Early Radiological Consequences Analysis.*, Tri Dasa Mega, 25 (2), 61.

Indonesia possesses numerous potential sites for nuclear power plant development. A fast and comprehensive radiological consequences analysis is required to conduct a preliminary analysis of radionuclide release into the atmosphere, including source terms estimation. One simplified method for such estimation is the use of the Relative Volatility approach by Kess and Booth, published in IAEA TECDOC 1127. The objective of this study was to evaluate the use of a simple and comprehensive tool for estimating the source terms of planned nuclear power plants to facilitate the analysis of radiological consequences during site evaluation. Input parameters for the estimation include fuel burn-up, blow-down time, specific heat transfer of

fuel to cladding, and coolant debit, using 100 MWe PWR as a case study. The results indicate a slight difference in the calculated release fraction compared to previous calculations, indicating a need to modify the Relative Volatility method for high-fuel burn-up implementation.

Keywords: Source terms, Relative volatility, Release fraction, PWR, SMART.

Muhammad Reza Maulana Aliva, Nofi Yendri Sudiar, Hamdi., *Systematic Literature Review (SLR): Nuclear Power Plants.*, Tri Dasa Mega, 25 (1), 69.

A Nuclear Power Plant (NPP) is a thermal power plant using one or several nuclear reactors as its heat source. NPP uses radioactive materials such as uranium as the heat source by utilizing fission reactions. The fission reaction produces enormous heat energy. Currently, there are many studies on NPPs, ranging from technological developments to the environmental impact of the NPP itself. This study aims to identify research developments on nuclear power plants from around the world obtained from relevant international journals in 2017-2023. The method used in this study is the Systematic Literature Review (SLR) method. The SLR method is used to identify, review, evaluate, and conclude all available research with interesting topic areas, with specific relevant research questions. Data were obtained by searching journals with Harzing's Publish or Perish application from the Scopus journal database. There are 191 journals with the keyword " Nuclear Power Plant " obtained from the Scopus database. Then these journals are filtered by type of article and if the number of citations is more than 32, then 49 articles are obtained which will be reviewed. This SLR method shows the development of research on NPP in several developed countries that have been using this technology for a long time. In addition, research topics such as the Fukushima accident, fault diagnostics, and safety assessment are the most discussed topics in the research so that they can be used as a reference for countries that are developing NPP.

Keywords: Systematic Literature Study, Nuclear Power Plants, Research Development, Technological Developments, Fault Diagnostics, Safety Assessment.

Iklimatul Karomah, Ahmad Muzaki Mabruri1, Ratna Dewi Syarifah, Nuri Trianti., *Analysis of Core Configuration for Conceptual Gas Cooled Fast Reactor (GFR) using OpenMC.*, Tri Dasa Mega, 25 (2), 85.

This study focused on a conceptual core configuration of Gas Cooled Fast Reactor (GFR), as part of a generation IV reactor. Uranium-plutonium carbide (UC-PuC) was used as reactor fuel and a Monte Carlo simulation method using OpenMC has been carried out. This study aims to find the composition of uranium-plutonium carbide fuel to use inside a fuel pin, making up a hexagonal prism fuel assembly arranged to form a full core. A homogeneous and heterogeneous core configuration was considered in this study, while the plutonium percentage varied from 8%-15%. For the homogenous core configuration, 10% was found as the optimum plutonium fraction with the value of %Δk/k =1, which was then used as a reference to make up a heterogeneous core configuration. A heterogeneous core with 3 radial fuel regions of F1 using 9% Pu fraction, F2 10%, and F3 11% showed the most stable result for 5-year burn-up with a %Δk/k of 0.7. The %Δk/k value was decreased by 0.3 due to the fission reaction that occurred more evenly in all 3 fuel regions of heterogeneous configuration, reducing the core power peaking factor.

Keywords: Core configuration, GFR, OpenMC, Reactivity, Fission reaction.

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