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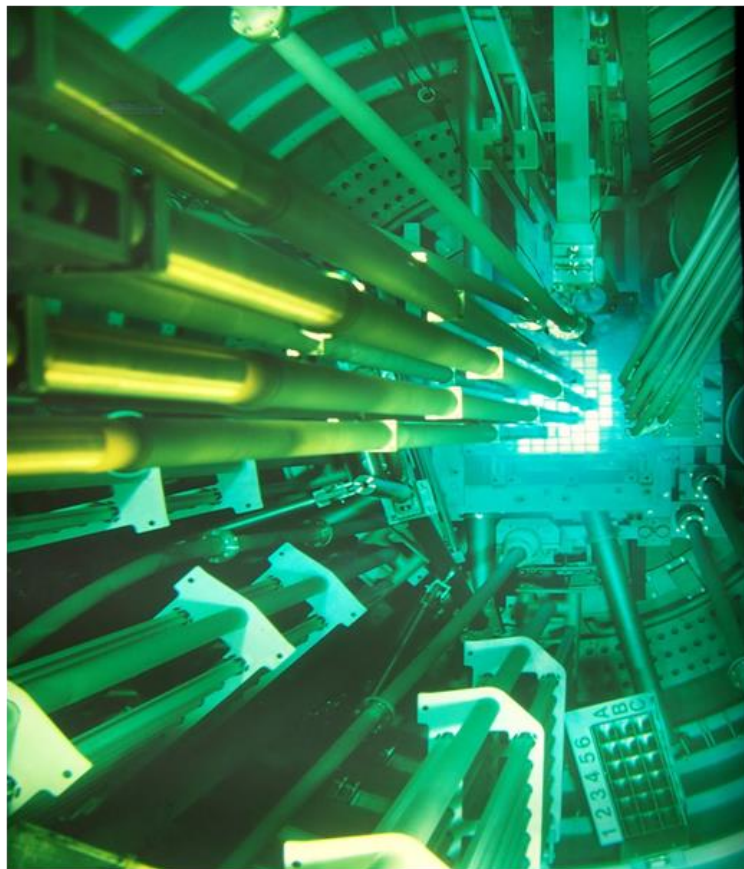
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PREFACE

Dear readers,

With great pleasure, we provide you with the first issue of the *Jurnal Teknologi Reaktor Nuklir* (Journal of Nuclear Reactor Technology), Tri Dasa Mega, in 2023 – Vol. 25 No. 1 (February 2023). This issue contains five articles discussing various applications of nuclear technologies and sciences.

The first article “Design of Helical Type Steam Generator for Experimental Power Reactor” was written by Sunny Ineza Putri, Prihadi Setyo Darmanto, Raden Mohammad Subekti from the 1Master Student of Faculty of Mechanical and Aerospace Engineering Bandung Institute of Technology, Bandung, Indonesia. They study about design of the RDE reactor. Empirical and numerical calculations are needed to strengthen the existing design. The numerical method by computational fluid dynamic (CFD) analyzes temperature distribution and pressure drop along the pipe. The RDE steam generator design has a seven-layer helical pipe model, while this research uses a one-layer helix pipe. In empirical calculations, the heat transfer region has three sections; single-phase liquid, two-phase, and single-phase vapor heat transfer. In numerical calculations, applied constant heat flux and constant working fluid properties. The empirical calculations data showed that the helical pipe height was 3.98 m, shorter than the existing design, which is 4.97 m. This considerable difference is due to empirical calculations, which did not cover the safety factor. The results of numerical calculations show that in the single-phase, empiric calculation data were acceptable since the different values of numerical calculations for empiric calculation data were below 10%.

The second article “Gamma Radiation Effects on the Performance of Mono-crystalline Solar Cells” was investigated by Soni Prayogi, Zainuddin from the Department of Electrical Engineering, Faculty of Industrial Engineering, Pertamina University, Jakarta, Indonesia. This research is focused on the solar cells that were subjected to various levels of ^{60}Co gamma radiation. The solar cells we use are mono-crystalline, which has a stable crystal structure and high efficiency compared to polycrystalline. Prior to and during gamma irradiation, the current-voltage characteristics of monocrystalline silicon solar cells under AM1.5 light conditions and their photon spectral currents were examined. The results of the experiment demonstrate that as a dose of gamma radiation increases, solar cell metrics including open circuit voltage (V_{oc}), short circuit current (I_{sc}), and efficiency (η) drop. The photon spectral current demonstrates that as dose gamma is increased, the current decreases at shorter wavelengths, and the defects are primarily produced near the solar cell's surface. Our findings demonstrate the gamma irradiation-induced breakdown of silicon solar cells and the minority carrier lifetime which demonstrates that the minority carrier lifetimes sharply decline with increasing radiation dose.

The third article “Design Scenario and Analysis for Preliminary Specification of Steam Generator in the PeLUIt-40” was studied by Byan Wahyu Riyandwita, Muhammad Subhan, Topan Setiadipura, Almira Citra Amelia, Sri Hastuty, Purwo Kadarno, Farisy Yogatama, from the Department of Mechanical Engineering, Faculty of Industrial Technology, Universitas Pertamina, Jakarta, Indonesia. They study the helical steam generator of HTGR nuclear reactor called PeLUIt-40 for steam production. Steam is used to generate electricity and hydrogen. A once-through helical tube bundle was employed because of its ability to endure mechanical stress due to thermal expansion, high resistance to flow-induced vibrations, and better thermal performance compared to a straight tube one. To produce the targeted steam, a design analysis of the once-through helical steam generator needs to

be conducted. A quick evaluation method was used to predict the preliminary specifications required for steam production. Simple thermodynamic calculations combined with empirical heat transfer coefficients covering convective and boiling processes at constant pressure were used to carry out the analysis. Two scenarios were conducted to evaluate the design choice based on the previous design of RDE-10.

The fourth article “Determining Gamma Source in Uranium Molybdenum of Fuel in G.A Siwabessy Multi-Purpose Reactor” was explored by Dewi Nur Riskiana, Anis Rohanda, Farzand Abdullatif, I Wayan Ngarayana, from the Physics Department, Jenderal Soedirman University, Purwokerto, Banyumas, Central Java, Indonesia. They study gamma radiation from nuclear fission reactions. A lot of radionuclides release energy, one of which is in the form of gamma radiation. Gamma radiation is produced by various types of radionuclides, and nuclear reactor fuel will produce different values of gamma intensity. Uranium Molybdenum (U7MO-Al) is the type of nuclear fuel for future research reactors. For the application of molybdenum-based fuel, it is necessary to determine the resulting gamma radiation. The purpose is to determine the gamma radiation produced from molybdenum-based fuel with various densities. This study begins with the determination of the mass composition of the reactor component and calculations with ORIGEN2. This result explains that the intensity of the gamma radiation produced is directly proportional to the fuel density. The low intensity of gamma radiation in molybdenum-based fuel can be used as a suggestion in shielding design to ensure the operational safety of reactors.

The fifth article “Synthesis and Characterization of Cesium Silicate to Determine Its Detailed Properties as Chemisorbed onto Structural Materials of Light Water Reactor During Severe Accident Conditions” was investigated by I Wayan Ngarayana, from the Research Center for Technology Nuclear Reactor and Safety, Research Organization for Nuclear Technology, National Research and Innovation Agency, South Tangerang, Banten. The paper is presented the Cesium chemisorption phenomenon strongly contributing to the source terms transport during LWR accidents. Large amounts of cesium silicates are identified to be chemisorbed onto structure material, reduce cesium volatility, and affect the late release and re-vaporization phenomena. Although it has been studied for a long time, several characteristics of these compounds are still under discussion. In this study, Cs₂SiO₃, Cs₂Si₂O₅, and Cs₂Si₄O₉ were synthesized through the solid-state method and the results have been confirmed using X-Ray Diffraction (XRD) measurement. Furthermore, their crystal structures have been refined based on the XRD analysis. The crystal structure refinement of these compounds proves the previous studies, but with minor distinctions in the lattice parameters. XRD patterns changing over time when measured in the open-air environment also show that Cs₂Si₄O₉ is the most stable species among other cesium silicate species. This indicates that the chemisorbed Cs-Si-O compound onto the structural material as identified by previous studies is most likely Cs₂Si₄O₉ rather than Cs₂SiO₃ or Cs₂Si₂O₅. Therefore, detailed Cs₂Si₄O₉ identification including its thermodynamic properties characterization could be very useful to enhance the database that is being built to improve current source terms transport codes

On behalf of the Jurnal Teknologi Reaktor Nuklir (Journal of Nuclear Reactor Technology) Tri Dasa Mega, I would like to thank all Editors, Reviewers, Managements, Authors, and Readers for your endless support.

Editor in Chief