LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : JURNAL ILMIAH

Judul Karya Ilmiah (Artikel)	:	Comparison of 192Os(p,n)192Ir and 192Os(d,2n)192Ir Nuclear Reactions for 192Ir Production
Jumlah Penulis	:	4 orang
Status Pengusul	:	~~Penulis pertama~~/ Penulis ke-3/ ~~Penulis Korespondesi~~ **
Identitas Jurnal Ilmiah	:	a. Nama Jurnal : Atom Indonesia b. Nomor ISSN : 0126-1568 c. Volume, Nomor, Bulan, Tahun : Vol. 46 , No. 1, April 2020 d. Penerbit : National Nuclear Energy Agency e. DOI artikel (jika ada) : https://doi.org/10.17146/aij.2020.955 f. Alamat web jurnal : https://aij.batan.go.id/index.php/aij/article/view/955 g. Terindeks di Scimagojr/Scopus ~~atau di….**~~
Kategori Publikasi Jurnal Ilmiah (beri ✓pada kategori yang tepat)	:	[√] ~~Jurnal Ilmiah Internasional~~ / Internasional Bereputasi ** [ ] Jurnal Ilmiah Nasional Terakreditasi [ ] Jurnal Ilmiah Nasional/Nasional Terindeks di DOAJ, CABI, COPERNICUS**

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c. Kecukupan dan kemutahiran data/informasi dan metodologi (30%)	11	11	11
d. Kelengkapan unsur dan kualitas penerbit (30%)	12	11	11,5
Total = (100%)			37,75
Nilai untuk Pengusul : (40% x 37,75) / = 5,03			

Semarang, 26 Mei 2022

Reviewer 1

Prof. Dr. Drs. Wahyu Setia Budi, M. S.
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		Alamat Artikel : https://aij.batan.go.id/index.php/aij/article/download/955/785
		Turnitin : 19%
		g. Terindex : Scopus (Q4 SJR = 0,16 H-Index = 9)

Kategori Publikasi Jurnal Ilmiah (beri ✓pada kategori yang tepat) :
- [√] ~~Jurnal Ilmiah Internasional~~/Internasional Bereputasi
- [ ] Jurnal Ilmiah Nasional Terakreditasi
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Hasil Penilaian *Peer Review* :

Komponen Yang Dinilai	Nilai Maksimal Jurnal Ilmiah			Nilai Akhir Yang Diperoleh
	Internasional [√]	Nasional Terakreditasi [ ]	Nasional Tidak Terakreditasi [ ]	
a. Kelengkapan unsur isi jurnal (10%)	4			4
b. Ruang lingkup dan kedalaman pembahasan (30%)	12			12
c. Kecukupan dan kemutahiran data/informasi dan metodologi (30%)	12			11
d. Kelengkapan unsur dan kualitas terbitan/jurnal (30%)	12			12
Total = (100%)	**40**			39
Nilai Pengusul =	0,4 x 39/3 = 5,2			

Catatan Penilaian artikel oleh Reviewer :

1. **Kesesuaian dan kelengkapan unsur isi jurnal:**
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2. **Ruang lingkup dan kedalaman pembahasan:**
   Tidak dibahas dengan referensi
3. **Kecukupan dan kemutakhiran data/informasi dan metodologi:**
   Baik 4 dari 23 pustaka lebih 5 tahun.
4. **Kelengkapan unsur dan kualitas terbitan:**
   Baik

Semarang, 26 Mei 2022
Reviewer 1

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Hasil Penilaian *Peer Review* :

Komponen Yang Dinilai	Nilai Maksimal Jurnal Ilmiah			Nilai Akhir Yang Diperoleh
	Internasional [√]	Nasional Terakreditasi [ ]	Nasional Tidak Terakreditasi [ ]	
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c. Kecukupan dan kemutahiran data/informasi dan metodologi (30%)	12			11
d. Kelengkapan unsur dan kualitas terbitan/jurnal (30%)	12			11
Total = (100%)	**40**			**36,5**
Nilai Pengusul = 40% x 1/3 x 36,5 = 4,87				

Catatan Penilaian artikel oleh Reviewer :

1. **<u>Kesesuaian dan kelengkapan unsur isi jurnal:</u>**
   Keseuaian dan kelengkapan jurnal sesuai dan lengkap seperti yang terlihat pada komponen-komponennya: abstrak, pendahuluan, prosedur eksperimen, hasil dan pembahasan, kesimpulan dan dafar pustaka yang digunakan.
2. **<u>Ruang lingkup dan kedalaman pembahasan:</u>**
   Paper ini membahas kajian tentang produksi radionuklida Iridium-192 sebagai bahan yang digunakan dalam brakhiterapi. Diperlukan Ir-192 dengan impuritas yang tinggi untuk keperluan itu, sehingga perlu pendalaman terkait parameter iradiasi, termasuk energi partikel, persiapan dan ketebalan target, arus berkas partikel dan waktu iradiasi. Hasil penelitian ini dapat digunakan sebagai referensi untuk produksi radionuklida Ir-192 di masa depan ketika sinar proton atau deuteron dipertimbangkan untuk digunakan.
3. **<u>Kecukupan dan kemutakhiran data/informasi dan metodologi:</u>**
   Data-data hasil yang diperoleh dalam penelitian baik didukung metode teori yang tepat dengan jumlah referensi kurang dari 5 tahun sejumlah 18.
4. **<u>Kelengkapan unsur dan kualitas terbitan:</u>**
   Karya ini diterbitkan dalam jurnal berkualitas Q4 dengan SJR 0,21 oleh National Nuclear Energy Agency dengan unsur-unsur yang lengkap serta kualitas yang baik.

Semarang, 7 Juni 2022
Reviewer 2

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Comparison of ^{192}Os(p, n)^{192}Ir and ^{192}Os(d,2n)^{192}Ir nuclear reactions for ^{192}Ir production

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Save all to author list

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Abstract

Iridium-^{192} (^{192}Ir) is a radionuclide currently suggested for brachyteraphy. One of the methods employed to produce high purity ^{192}Ir is by irradiation of Osmium-^{192} (^{192}Os) target using cyclotron. The success of ^{192}Ir radionuclide production in cyclotrons requires deep understanding of irradiation parameters, including particle energy, target preparation and thickness, particle beam curent and irradiation time. Therefore, theoretical calculations of the ^{192}Ir radioactivity yields should be carried out as a preliminary measure for more efficient ^{192}Ir production. In this study, ^{192}Ir production was simulated using the SRIM 2013 program to determine the optimum target thickness while the nuclear cross-section data were extracted from TENDL 2017. Two nuclear reactions for ^{192}Ir production yield calculations were compared, i.e., ^{192}Os(p, n)^{192}Ir and ^{192}Os(d,2n)^{192}Ir. The radioactivity yields for ^{192}Os(p, n)^{192}Ir nuclear reaction was found to be lower than ^{192}Os(d,2n)^{192}Ir reaction. For proton and deuteron energy of 30 MeV, the maximum radioactivity yield was 6.79 GBq for ^{192}Os(p, n)^{192}Ir and 26.14 GBq for ^{192}Os(d,2n)^{192}Ir. Several radionuclide impurities such as 191mIr, 190Ir, 191Os and 189Re

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Safety Analysis of the TRIGA 2000 U_3Si_2-Al Fuel Core Under Reactivity Insertion Accidents

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ABSTRACT

The TRIGA 2000 reactor in Bandung is planned to change its fuel type from the TRIGA fuel rod type to the U_3Si_2-Al plate type of low enriched uranium of 19.75 % with uranium density of 2.96 gU/cc. A study on the neutronic parameters from the equilibrium core has been done. To ensure safe operation of the new fuel, thermodynamic evaluation of the core needs to be done. The purpose of this study is to conduct a reactor safety analysis of reactivity insertion during withdrawal of the control rod and to study the effect of this reactivity insertion on the power and the maximum temperature of the fuel and the cladding. Reactivity insertion accident is the main factor of the design basis accidents in nuclear reactor design. A simulation of transient for reactivity insertion has been carried out using a coupled neutronic and thermal-hydraulic MTR-DYN code. The code was developed based on three-dimensional multigroup neutron diffusion theory. The coupled space and time-dependent problem were solved by adiabatic model. Transient analysis was performed for a reactivity insertion of 32.33 pcm/s with the assumption that all of the control rods were rapidly withdrawn. For the insertion at a low power of 100 W, the maximum power achieved was 2.74 MW while a maximum power of 2.3 MW was achieved for the power transient of 1 MW. The maximum temperature of the coolant, the cladding, and the fuel for TRIGA 2000 core does not exceed the allowable safety limit for reactivity insertions.

INTRODUCTION

The TRIGA MARK II Bandung reactor has been operated since 1964 under a thermal power of 250 kW. To enhance radioisotope production capability and other research activities, the reactor power was up-rated to 1 MW in 1971. With the increasing demand of medical radioisotopes, the TRIGA MARK II serves as a backup reactor in case the RSG-GAS is in outage condition. To fulfill the task, the TRIGA MARK II reactor power was again increased to 2 MW in 2000 and the name of the reactor was changed to TRIGA MARK 2000 Bandung reactor.

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At present, the TRIGA 2000 Bandung reactor is still operating using the standard TRIGA fuel elements (FE) supplied by General Atomics (GA). Currently, however, the GA as the sole supplier of TRIGA reactor standard FEs has decided to cease the production, so the reactor operation now uses the available burnt FEs and a limited number of fresh FEs purchased in the past. On the other hand, PT INUKI (a BATAN subsidiary company) has long time experience in producing plate type FEs for domestic material testing reactor (MTR) of the RSG-GAS reactor. In relation to this expertise in domestic FEs manufacturing, to assure long-term continuation of the reactor operation, BATAN initiated a core conversion program in 2015, namely, a switch to the use of the domestically manufactured MTR plate-type FEs for replacing the GA FEs.

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Effect of Ion Irradiation on the Mechanical Properties of High and Low Copper

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ABSTRACT

An investigation into the effects of proton beam exposure on high- and low-copper structural materials for nuclear reactors has been carried out. The aim of this work was to investigate the impact of proton energy irradiation on the damage of the materials. The damage parameter used in the evaluation was displacement per atom (dpa) in material as a function of proton energy. In addition, a TRIM code was used to identify the penetration depth in response to changes in proton energy. The effect of proton beam exposure on the irradiation induced hardening of the different copper levels was investigated by Vickers Hardness tests for microstructural changes examination. The proton beam incident energy was 3 MeV and the temperature was kept at approximately 30 ^{o}C. A 25 μm flat damage profile was achieved at 0.367 and 0.373 dpa for low and high copper samples, respectively. The hardness variation with depth and yield strength variation with dose (dpa) were also investigated. Based on the results, the study found that the hardness test for the high copper was higher than the low copper.

INTRODUCTION

Ion irradiation experiments allow control of ion energy, dose, dose rate and temperature to obtain reproducible and specific results desirable for studying changes in irradiated micro-structure and property of a material in a shorter time [1-3]. However, the evolution of irradiated microstructure is dependent upon a combination of damage rate and irradiation temperature. Damage cannot always be reproduced in a relatively shorter time through increased displacement rate (dpa/s) alone, so temperature shift relations have to be created to allow for more correlation of one type of damage evolution from one irradiation environment to another using dose, dose rate and temperature [4]. One of the advantages of using proton beam is that parameters can be easily varied. Ion beams are also generally cheaper to produce a given dose compared to neutron sources.

Copper impurity has been found in older generation reactor pressure vessel (RPV) steels due to the use of copper coated welding rods [5]. It was found that 0.3 and 0.05 wt% were used for high and low impurity levels of copper, respectively. A study by Zhang *et al*. [6] suggests that copper precipitates that are rich in other impurities (Ni, Al and Mn) formed under proton irradiation remain stable with further irradiation. Clusters of these precipitates inhibit the movement of dislocations under stress, which causes a net increase in hardness after irradiation. The mechanism of irradiation hardening is similar to that of aging except that proton radiation increases the free movement of vacancies, which encourages the diffusion of solutes. Another similarity to thermal aging is that under irradiation, instead of dissolving the precipitates coarsen. This fenomena cause the material to soften to some degree [6]. The conclusions that can be drawn from Zhang *et al*. [6] is that hardness increases with segregation of impurities in RPV steels, one of them is copper. Their binding to point defects in the matrix furthers the movement of these Cu-rich precipitate clusters. These clusters migrate to the areas of low energy such as grain boundaries, and sometimes they act as 'sinks' to which point defects

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