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EDITORIAL

Dear reader,

It is a great pleasure to provide you the third issue of Atom Indonesia in 2019, namely Vol. 45 No. 3 (2019). Since SCOPUS and Web of Science (WOS) indexed Atom Indonesia, the number of articles submitted to Atom Indonesia has significantly increased. To retain the quality of the publications, all articles submitted to Atom Indonesia are peer reviewed by qualified editors and reviewers and is supported by a professional administration team.

The Atom Indonesia Vol. 45 No. 3 (2019) contains eight articles discussing various aspects and applications of nuclear science and technology. The contributors of those articles are not only from various national institutions and universities, but also from international institutions.

"Spectral Comparison of Neutron-Irradiated Natural and Enriched Ytterbium Targets for Lu-177 Production" was explored by M. Maiyesni, S. Febriana, and D. Kurniasih from the Center for Radioisotope and Radiopharmaceutical Technology, National Nuclear Energy Agency, Jakarta, Indonesia in collaboration with I. Kambali from the Center for Accelerator Science and Technology, National Nuclear Energy Agency, Yogyakarta, Indonesia. Beta-emitting radioisotope ^{177}Lu has been suggested for Radioimmunotherapy, peptide receptor radionuclide therapy, or another radionuclide therapy due to its excellent properties for destroying cancer cells. In this experimental investigation, natural ytterbium (^{nat}Yb) and enriched ^{176}Yb targets were irradiated with thermal neutrons at 1.2×10^{14} $cm^{-2}s^{-1}$ neutron flux for 95 hours. Using a high-purity germanium (HPGe) detector-based spectroscopy system, the post-irradiated targets were measured and the produced radioisotopes were identified according to their gamma ray emissions.

"The Role of BNCT in Breast Cancer Treatment" was studied by B. Poedjomartono from the Department of Radiology, Faculty of Medicine, University of Gadjah Mada, Yogyakarta, Indonesia under collaboration with Y. Sardjono from the Center for Accelerator Science and Technology, National Nuclear Energy Agency, Yogyakarta, Indonesia, E. Meiyanto from the Faculty of Pharmacy, University of Gadjah Mada, Yogyakarta, Indonesia and H. Winarno from the Center for Isotopes and Radiation Application, National Nuclear Energy Agency, Jakarta, Indonesia. Boron neutron capture therapy (BNCT) is a promising future technique of breast cancer therapy. BNCT is a cell-targeting therapy. In BNCT, the use of boron-10 combined with cur cumin analog will provide selective radiation therapy only to breast cancer cells, whereas healthy cells will not be affected.

"Evaluation of Kidney Dose in Neuroendocrine Tumors Patients after Peptide Receptor Radionuclide Therapy using ^{177}Lu-DOTATATE" was written by N.R. Hidayati from the Center for Technology of Radiation Safety and Metrology, National Nuclear Energy Agency, Jakarta, Indonesia, in collaboration with A. Poon from the Department of Nuclear Medicine, Austin Health, Melbourne, Australia, K. Willowson from the Department of Nuclear Medicine, Royal North Shore Hospital, Australia, E. Eslick, H. Ryu and D.L. Bailey from the University of Sydney, Australia. Radiation dose to the kidneys (kidney dose) in ^{177}Lu-DOTATATE - Peptide Receptor Radionuclide Therapy (PRRT) is considered to be the main potential side-effect from the treatment. Prospective assessment of kidney radiation dose can be made with SPECT, however, this requires an intensive imaging regime over a number of days. For this reason, a retrospective investigation of kidney uptake using quantitative SPECT was performed. The aim of the study was to compare the estimated radiation dose to kidneys for each cycle. Seventeen patients treated with ^{177}Lu-DOTATATE for metastatic neuro-endocrine tumors had full imaging for each of their treatment cycles on a Siemens Intevo SPECT/CT gamma camera.

"The Effect of Gamma-Irradiated Nitrate-Reducing Bacteria in Decreasing the *In Vitro* Production of Methane by Buffalo Rumen Liquid" was explored by R. Rahmani and M.R. Pikoli from the Department of Biology, Faculty of Science and Technology, Syarif Hidayatullah State Islamic University Jakarta, Ciputat, Indonesia, under collaboration with I. Sugoro from the Center for Isotopes and Radiation Application, National Nuclear Energy Agency, Jakarta, Indonesia. Ruminant livestock undeniably contributes to the increase of greenhouse gases by emitting methane. One strategy used to reduce methane emission is by applying nitrate-reducing bacteria (NRB). Utilizing active NRB has a side effect of acidosis in rumen liquid in an uncontrolled condition. Alternatively, NRB can be applied in an inactive form. The aim of this study was to examine the use of gamma irradiation on NRB to be used for decreasing methane production by buffalo rumen liquid. The examination was performed *in vitro* and involved comparison to other treatments, which were active NRB, autoclaved NRB, and without NRB. The result showed that the NRB in either active or the inactive condition affected fermentation of the rumen microorganisms.

"Antiproliferative Activity of Extracts and Fractions from Irradiated *Curcuma zanthorrhiza* Rhizomes Against Mouse Leukemia and Human Cancer Cell Lines" was written by E.K. Winarno, H. Winarno and S. Susanto from the Center for Isotopes and Radiation Application, National Nuclear Energy Agency, Jakarta, Indonesia. *Curcuma zanthorrhiza* Roxb is a medicinal plant that is used as a raw material in the herbal medicine and pharmaceutical industries. The main content of *C. zanthorrhiza* is Curcuminoids, which is used as an antioxidant and an anticancer agent. The aim of this research was to study the effect of gamma radiation used for preserving simplicia or herbal drugs through the examination of their cytotoxicity against mouse leukemia L1210 cells and antiproliferative activity against human cancer cell lines HUT78, A549, HeLa, and THP1. The result showed that irradiation of samples under doses up to 10 kGy can be used to preserve *Curcuma zanthorrhiza* simplicia without damaging its efficacy.

"Nanostructure and Magnetic Field Ordering in Aqueous Fe_3O_4 Ferrofluids: A Small-Angle Neutron Scattering Study" was explored by A. Taufiq, Sunaryono and N. Hidayat from the Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Negeri Malang, Malang, Indonesia, under collaboration with E.G.R Putra from the Polytechnic Institute of Nuclear Technology, National Nuclear Energy Agency, Yogyakarta, Indonesia, A. Okazawa from the Department of Basic Science, The University of Tokyo, Komaba, Tokyo, Japan, and I. Watanabe from the Advanced Meson Science Laboratory, Nishina Center, RIKEN, Saitama, Japan, N. Kojima from the Toyota Physical and Chemical Research Institute, Nagakute, Aichi, Japan, Pratapa and D. Darminto from the Department of Physics, Faculty of Science, Sepuluh Nopember Technology Institute, Sukolilo, Surabaya, Indonesia. Despite the importance of reducing production costs, investigating the hierarchical nanostructure and magnetic field ordering of Fe_3O_4 ferrofluids is also important to improve its application performance. Therefore, we proposed an inexpensive synthesis method in producing the Fe_3O_4 ferrofluids and investigated their detailed nanostructure as the effect of liquid carrier composition as well as their magnetic field ordering. In the present work, the Fe_3O_4 ferrofluids were successfully prepared through a coprecipitation route using a central precursor of natural Fe_3O_4 from iron sand. The nanostructural behaviors of the Fe_3O_4 ferrofluids, as the effects of the dilution of the Fe_3O_4 particles with H_2O as a carrier liquid, were examined using a small-angle neutron spectrometer (SANS). The Fe_3O_4 nanopowders were also prepared for comparison. A single lognormal spherical distribution and a mass fractal model were applied to fit the neutron scattering data of the Fe_3O_4 ferrofluids.

"Investigation on the Performance of a Wickless-Heat Pipe Using Graphene Nanofluid for Passive Cooling System" was written by M.H. Kusuma and N. Putra from the Applied Heat Transfer Research Group, Department of Mechanical Engineering, Universitas Indonesia, in collaboration with A. Rosidi and M. Juarsa from the Center for Nuclear Reactor Technology and Safety, National Nuclear Energy Agency, Puspiptek Area Serpong, Indonesia, S. Ismarwanti from the Center for Nuclear Fuel Technology, National Nuclear Energy Agency, Puspiptek Area Serpong, Indonesia, A.R. Antariksawan from the

Center for Accelerator Science and Technology, National Nuclear Energy Agency, Yogyakarta, Indonesia, T. Ardiyati from the Center for Nuclear Facilities Engineering, National Nuclear Energy Agency, Puspiptek Area Serpong, Indonesia and T.M.I. Mahlia from the School of Information, Systems and Modeling, Faculty of Engineering and Information Technology, University of Technology Sydney, Australia. To enhance the thermal safety in case of station blackout, a wickless-heat pipe is proposed as an alternative passive cooling system technology to remove decay heat generation in the nuclear spent fuel storage pool. The objectives of this research are to investigate the heat transfer phenomena in vertical straight wickless-heat pipe using Graphene nanofluid working fluid and to study the effect of Graphene nanofluid on the vertical straight wickless-heat pipe thermal performance. The investigation was conducted in 6 meters height and 0.1016 m inside diameter of vertical straight wickless-heat pipe. In this research, the Graphene nanofluid with 1 % of weight concentration was used as working fluid. The effect of working fluid filling ratio, evaporator heat load, and coolant volumetric flow rate on the water jacket were studied.

"Absolute Standardization Methods of ^{32}P to Calibrate Nuclear Medicine Instruments in Indonesia", was explored by G. Wurdiyanto, H. Candra and Holnisar from the Center for Technology of Radiation Safety and Metrology, National Nuclear Energy Agency, Jakarta, Indonesia, under collaboration with V. Pungkun from the Office of Atoms For Peace, Chatuchak, Bangkok, Thailand. The absolute standardization of ^{32}P radioactive sources employed to calibrate nuclear medicine instruments has been conducted at PTKMR-BATAN. We deemed this activity to be necessary since ^{32}P used in the nuclear medicine fields has a short half-life, and in order to obtain a result of quality measurement, it requires a special treatment. Moreover, in Indonesia, the use of nuclear medicine techniques has developed rapidly. We prepared all the radioactive sources with a gravimetric method by using a *KERN ABT 220-5DM* semi-micro type scale, traceable to the International Unit System.

On behalf of Atom Indonesia, I would like to thank you all for all of your contributions and endless support that have allowed Atom Indonesia to reach an outstanding performance for all the years. This outstanding achievement could not have been reached without great efforts and cooperation from the editors, reviewers, management personnel, authors, and readers.

Editor in Chief