

RADIOCHIMICA ACTA

INTERNATIONAL JOURNAL FOR CHEMICAL
ASPECTS OF NUCLEAR SCIENCE AND TECHNOLOGY

EDITOR-IN-CHIEF

S. M. Qaim, Jülich

EDITORS

T. E. Albrecht-Schönzart, Tallahassee

Z. Chai, Beijing

Ch. E. Düllmann, Mainz

S. S. Jurisson, Columbia

C. Le Naour, Orsay Cedex

P. K. Mohapatra, Mumbai

A. Yokoyama, Kanazawa

ADVISORY BOARD

W. Cha, Daejeon

N. Dacheux, Montpellier

R. Eichler, Villigen

C. Ekberg, Gothenburg

N. D. M. Evans, Nottingham

M. Fassbender, Los Alamos

H. Geckeis, Karlsruhe

J. John, Prague

S. N. Kalmykov, Moscow

S. Lahiri, Kolkata

V. K. Manchanda, Mumbai

G. Modolo, Jülich

Y. Nagame, Ibaraki

B. Neumaier, Jülich

F. Rösch, Mainz

Th. J. Ruth, Vancouver

X. Wang, Beijing

J. H. Zaidi, Islamabad

DE GRUYTER

ABSTRACTED/INDEXED IN Baidu Scholar · Cabells Journalytics · Chemical Abstracts Service (CAS): CAPlus; SciFinder · Chimica · CNKI Scholar (China National Knowledge Infrastructure) · CNPIEC: cnpLINKer · Dimensions · EBSCO (relevant databases) · EBSCO Discovery Service · Engineering Village · Genamics JournalSeek · Google Scholar · IBR (International Bibliography of Reviews of Scholarly Literature in the Humanities and Social Sciences) · IBZ (International Bibliography of Periodical Literature in the Humanities and Social Sciences) · Inspec · Japan Science and Technology Agency (JST) · J-Gate · Journal Citation Reports/Science Edition · JournalGuide · JournalTOCs · KESLI-NDSL (Korean National Discovery for Science Leaders) · Microsoft Academic · MyScienceWork · Naver Academic · Naviga (Softweco) · Primo Central (ExLibris) · Publons · QOAM (Quality Open Access Market) · ReadCube · Reaxys · SCImago (SJR) · SCOPUS · Semantic Scholar · Sherpa/RoMEO · Summon (ProQuest) · TDNet · Ulrich's Periodicals Directory/ulrichsweb · WanFang Data · Web of Science: Current Contents/Physical, Chemical and Earth Sciences; Science Citation Index; Science Citation Index Expanded · WorldCat (OCLC) · Yewno Discover

ISSN 0033-8230 · e-ISSN 2193-3405

All information regarding notes for contributors, subscriptions, Open access, back volumes and orders is available online at <http://www.degruyter.com/ract>

EDITOR-IN-CHIEF Professor Dr. Dr. h. c. mult. S. M. Qaim, Forschungszentrum Jülich GmbH, Institut für Neurowissenschaften und Medizin, INM-5: Nuklearchemie, 52425 Jülich, Germany, e-mail: s.m.qaim@fz-juelich.de

EDITORS Professor Dr. T. E. Albrecht-Schönzart, Gregory R. Choppin Chair in Chemistry, Department of Chemistry and Biochemistry, Director, Center for Actinide Science & Technology, Florida State University, 95 Chieftan Way, Tallahassee, Florida 32306, USA, e-mail: albrecht-schmitt@chem.fsu.edu

Professor Dr. Z. Chai, Chinese Academy of Sciences, Institute of High Energy Physics, Laboratory of Nuclear Analysis, P.O. Box 918, 100039 Beijing, China, e-mail: chaizf@mail.ihep.ac.cn

Professor Dr. Ch. E. Düllmann, Johannes Gutenberg-Universität Mainz, Department Chemie - Standort TRIGA, Fritz-Strassmann-Weg 2, e-mail: duellman@uni-mainz.de

Professor Dr. S. S. Jurisson, University of Missouri, Chemistry Department, Columbia, MO 65211, USA, e-mail: jurissons@missouri.edu

Dr. C. Le Naour, IJCLAB, 15 rue Georges Clémenceau, 91405 Orsay cedex, France, e-mail: lenaour@ipno.in2p3.fr

Professor Dr. Prasanta K. Mohapatra, Radiochemistry Division, Bhabha Atomic Research Centre, Mumbai-400085, India, e-mail: mpatra@barc.gov.in

Professor Dr. A. Yokoyama, Faculty of Chemistry, Institute of Science and Engineering, Kanazawa University, Kanazawa, Ishikawa 920-1192, Japan, e-mail: yokoyama@se.kanazawa-u.ac.jp

PUBLISHER Walter de Gruyter GmbH, Berlin/Boston, Genthiner Straße 13, 10785 Berlin, Germany

JOURNAL COORDINATOR Birgit Zoglmeier, De Gruyter, Rosenheimer Str. 143, 81671 München, Germany. Tel.: +49 (0)89 769 02-426, Fax: +49 (0)89 769 02-491, e-mail: Birgit.Zoglmeier@degruyter.com

RESPONSIBLE FOR ADVERTISEMENTS Markus Kügel, De Gruyter, Rosenheimer Str. 143, 81671 München, Germany. Tel.: +49 89 76 902-424, e-mail: anzeigen@degruyter.com

© 2022 Walter de Gruyter GmbH, Berlin/Boston, Germany

TYPESETTING TNQ Technologies, Chennai, India

DRUCK Franz X. Stickle Druck und Verlag e.K., Ettenheim



Contents

Syed M. Qaim and David Sleeman

Editorial: Diamond Jubilee Issue — 403

Syed M. Qaim and Birgit Zoglmeier

Sixty years of Radiochimica Acta: a brief overview with emphasis on the last 10 years — 405

A. Chemistry of Radioelements

Christoph E. Düllmann, Michael Block, Fritz P. Heßberger, Jadambaa Khuyagbaatar, Birgit Kindler, Jens V. Kratz, Bettina Lommel, Gottfried Münzenberg, Valeria Pershina, Dennis Renisch, Matthias Schädel and Alexander Yakushev

Five decades of GSI superheavy element discoveries and chemical investigation — 417

Tetsuya K. Sato and Yuichiro Nagame

Chemistry of the elements at the end of the actinide series using their low-energy ion-beams — 441

Sergey I. Nikitenko, Matthieu Virost and Philippe Moisy

Sonochemistry of actinides: from ions to nanoparticles and beyond — 453

Zhong-Ping Cheng, Xiao-Bo Li, Qun-Yan Wu, Zhi-Fang Chai and Wei-Qun Shi

Theoretical insights into the reduction mechanism of neptunyl nitrate by hydrazine derivatives — 471

Claire Le Naour, Melody Maloubier and Jean Aupiais

The speciation of protactinium since its discovery: a nightmare or a path of resilience — 481

Heinz W. Gäggeler, Bernd Eichler, Dieter T. Jost and Robert Eichler

On the volatility of protactinium in chlorinating and brominating gas media — 495

Paul L. Brown, Artem V. Matyskin and Christian Ekberg

The aqueous chemistry of radium — 505

B. Energy Related Radiochemistry

Andreas Wilden, Dimitri Schneider, Zaina Paparigas, Maximilian Henkes, Fabian Kreft, Andreas Geist, Eros Mossini, Elena Macerata, Mario Mariani, Maria Chiara Gullo, Alessandro Casnati and Giuseppe Modolo

Selective actinide(III) separation using 2,6-bis[1-(propan-1-ol)-1,2,3-triazol-4-yl]pyridine (PyTri-Diol) in the innovative-SANEX process: laboratory scale counter current centrifugal contactor demonstration — 515

Parveen K. Verma and Prasanta K. Mohapatra

Fate of Neptunium in nuclear fuel cycle streams: state-of-the art on separation strategies — 527

Timothy E. Payne and T. David Waite

Uranium adsorption – a review of progress from qualitative understanding to advanced model development — 549

Lei Li, Ran Ma, Xuwei Liu, Tao Wen, Bo Wu, Mingtai Sun, Zheng Jiang, Suhua Wang and Xiangke Wang
Targeted synthesis of carbon-supported titanate nanofibers as host structure for nuclear waste immobilization — 561

Wansik Cha, Tae-Hong Park and Jeong Hoon Park
Progress of energy-related radiochemistry and radionuclide production in the Republic of Korea — 575

C. Nuclear Data

Stephan Heinitz, Ivan Kajan and Dorothea Schumann
How accurate are half-life data of long-lived radionuclides? — 589

Alan L. Nichols
Status of the decay data for medical radionuclides: existing and potential diagnostic γ emitters, diagnostic β^+ emitters and therapeutic radioisotopes — 609

Mazhar Hussain, Waris Ali, Nouman Amjed, Abdul M. Wajid and Muhammad N. Aslam
An overview of nuclear data standardisation work for accelerator-based production of medical radionuclides in Pakistan — 645

M. Shuza Uddin, Syed M. Hossain, M. Asad Shariff and M. Rakib-uz-Zaman
An overview of activation cross-section measurements of some neutron and charged-particle induced reactions in Bangladesh — 663

Mogahed Al-Abyad, H. Ebrahim Hassan, Gehan Y. Mohamed, Zeinab A. Saleh, M. Nassef H. Comsan and Ahmed Azzam
Nuclear reaction data for medical and industrial applications: recent contributions by Egyptian cyclotron group — 675

Gaia Pupillo, Liliana Mou, Simone Manenti, Flavia Groppi, Juan Esposito and Ferid Haddad
Nuclear data for light charged particle induced production of emerging medical radionuclides — 689

D. Radionuclides and Radiopharmaceuticals

Syed M. Qaim, Ingo Spahn, Bernhard Scholten, Stefan Spellerberg and Bernd Neumaier
The role of chemistry in accelerator-based production and separation of radionuclides as basis for radiolabelled compounds for medical applications — 707

Nabanita Naskar and Susanta Lahiri
Production of neutron deficient rare earth radionuclides by heavy ion activation — 725

Anster Charles, Firouzeh Najafi Khosrashahi, Li Ma, Chathurya Munindradasa, Rebecca Hoerres, John D. Lydon, Steven P. Kelley, James Guthrie, David Rotsch, Dmitri Medvedev, Cathy S. Cutler, Yawen Li, D. Scott Wilbur, Heather M. Hennkens and Silvia S. Jurisson
Evaluation of $^{186}\text{WS}_2$ target material for production of high specific activity ^{186}Re via proton irradiation: separation, radiolabeling and recovery/recycling — 739

Kotaro Nagatsu, Tomoyuki Ohya, Honoka Obata, Kazutoshi Suzuki and Ming-Rong Zhang

Special radionuclide production activities – recent developments at QST and throughout Japan — 751

Xi-Yang Cui, Yu Liu, Changlun Wang, Zihao Wen, Yichen Li, Haocheng Tang, Juan Diwu, Yuchuan Yang, Mengchao Cui and Zhibo Liu

China's radiopharmaceuticals on expressway: 2014–2021 — 765

E. Environmental Radioactivity

Yasuhito Igarashi, Keiko Tagami, Koichi Takamiya and Atsushi Shinohara

A summary of environmental radioactivity research studies by members of the Japan Society of Nuclear and Radiochemical Sciences — 785