

Radiocarbon

An International Journal of Cosmogenic Isotope Research

VOLUME 60 • NUMBER 6 • 2018



The European Commission "CAST
(Carbon-14 Source Term)"
Project – A Summary of the Main
Results from the Final
Symposium

Guest Editor Simon Norris

14



Editor

A.J.T. Jull

CAMBRIDGE
UNIVERSITY PRESS

Radiocarbon

An International Journal of Cosmogenic Isotope Research

EDITOR

A. J. T. Jull · University of Arizona

MANAGING EDITOR

Kimberley Tanner Elliott · University of Arizona

ASSOCIATE EDITORS

Edouard Bard · Collège de France

Nancy Beavan · Cardiff University

Warren Beck · University of Arizona

Elisabetta Boaretto · Weizmann Institute

Christopher Bronk Ramsey · Oxford University

George S. Burr · University of Arizona

Owen K. Davis · University of Arizona

Ellen R. M. Druffel · University of California-Irvine

Pieter Grootes · Christian-Albrechts University

Irka Hajdas · ETH Zurich

Derek Hamilton · University of Glasgow

Christine Hatté · Laboratoire des Sciences du Climat et
l'Environnement

Gregory Hodgins · University of Arizona

Quan Hua · Australian Nuclear Science and Technology
Organisation

Yaroslav Kuzmin · Russian Academy of Sciences

Steven W. Leavitt · University of Arizona

Ann P. McNichol · Woods Hole Oceanographic Institution

Mihály Molnár · Hertelendi Laboratory of Environmental
Studies, Hungary

Toshio Nakamura · Nagoya University

Jesper Olsen · Aarhus AMS Center

Charlotte Pearson · University of Arizona

Pavel Povinec · Comenius University

Paula J. Reimer · Queen's University Belfast

E. Marian Scott · University of Glasgow

John R. Southon · University of California-Irvine

Jocelyn Turnbull · GNS Science

Johannes van der Plicht · Groningen University

Antoine Zazzo · Muséum national d'Histoire naturelle

Weijian Zhou · Institute of Earth Environment, Chinese
Academy of Science

Radiocarbon (ISSN 0033-8222) is published quarterly by Cambridge University Press, One Liberty Plaza 20th Floor New York, NY 10006. © 2018 by the Arizona Board of Regents on behalf of the University of Arizona. All rights reserved.

Editorial Office

Communications should be addressed to the Managing Editor, *Radiocarbon*, Department of Geosciences, The University of Arizona, 4717 East Fort Lowell Road, Tucson, AZ 85712-1201 USA. Tel.: +1 (520) 621-0641; Fax: +1 (520) 621-0584; Email: kimelliott@email.arizona.edu. Contributors should consult the Instructions for Contributors, which is available on the journal's Web site: cambridge.org/rdc.

Subscriptions

Annual subscription rates for Volume 60, 2018: Institutional rate is (print and electronic) \$524 in the USA, Canada, and Mexico, £338 + VAT elsewhere. Institutional rate (electronic only) \$381 in the USA, Canada, and Mexico, £245 + VAT elsewhere. Individual rate is (print and electronic) \$172 in the USA, Canada, and Mexico, £111 + VAT elsewhere. Individual rate (electronic only) \$132 in the USA, Canada, and Mexico, £86 + VAT elsewhere. Please direct subscription inquiries and requests for back issues to Customer Services at Cambridge University Press, email: subscriptions_newyork@cambridge.org (USA, Canada, and Mexico) or journals@cambridge.org (outside of USA, Canada, and Mexico).

Advertising

To advertise in the journal email advertising@cambridge.org or telephone +1 (212) 337 5062 in the USA, Canada, or Mexico; email ad_sales@cambridge.org or telephone +44 (01223) 325898 in the rest of the world.

Abstracting and indexing

Radiocarbon is indexed and/or abstracted by the following sources: *Anthropological Index*; *Anthropological Literature*; *Art and Archaeology Technical Abstracts*; *Bibliography and Index of Geology* (GeoRef); *British Archaeological Bibliography*; *Chemical Abstracts*; *Chemistry Citation Index*; *Current Advances in Ecological and Environmental Sciences*; *Current Contents* (ISI); FRANCIS (Institut de l'Information Scientifique et Technique – CNRS); *Geographical Abstracts*; *Geological Abstracts*; *Oceanographic Literature Review*; *Science Citation Index*; *Social Sciences Citation Index*.

List of laboratories

Our comprehensive list of laboratories is published annually, and is also available at www.radiocarbon.org. We ask all laboratory directors to provide their laboratory code designation, as well as current telephone and fax numbers, and email addresses. Changes in names or addresses, additions or deletions should be reported to the managing editor. Conventional and AMS laboratories are arranged in alphabetical order by country, and we include laboratories listed by code designation.

Permissions

No part of this publication may be reproduced, in any form or by any means, electronic, photocopying or otherwise, without permission in writing from Cambridge University Press. Policies, request forms and contacts are available at: <http://journals.cambridge.org/action/rightsAndPermissions>. Permission to copy (for users in the USA) is available from Copyright Clearance Center: <http://www.copyright.com>, email: info@copyright.com.

Postmaster: Send address changes to *Radiocarbon*, Cambridge University Press, One Liberty Plaza, New York, NY 10006, USA.

Radiocarbon

Vol 60, Nr 6, 2018

Selected Papers from the European Commission CAST (CARbon-14 Source Term) Project

CONTENTS

Attendees of Final CAST Symposium	iii
Overview of CAST Project <i>Simon Norris, Manuel Capouet</i>	1649
IRRADIATED STEELS	
Release and Speciation of ¹⁴ C during the Corrosion of Activated Steel in Deep Geological Repositories for the Disposal of Radioactive Waste <i>J Mibus, N Diomidis, E Wieland, S W Swanton</i>	1657
¹⁴ C Release from Irradiated Stainless Steel <i>Eva de Visser-Týnová, Stephen W Swanton, Stephen J Williams, Marcel P Stijkel, Alison J Walker, Robert L Otlet</i>	1671
Carbon-14 Release and Speciation from Carbon Steel in Highly Alkaline Conditions <i>Frank Druyts, Sébastien Caes, Peter Thomas</i>	1683
Identification of Chemical Form of Stable Carbon Released from Type 304L and 316L Stainless-Steel Powders in Alkaline and Acidic Solutions under Low-Oxygen Conditions <i>Ryo Nakabayashi, Tomonari Fujita</i>	1691
Quantification of Dissolved Organic ¹⁴ C-Containing Compounds by Accelerator Mass Spectrometry in a Corrosion Experiment with Irradiated Steel <i>Benjamin Z Cvetković, Gary Salazar, Dominik Kunz, Jan Tits, Sönke Szidat, Erich Wieland</i>	1711
¹⁴ C Release from Steels under Aerobic Conditions <i>M Rodríguez, J L Gascón, E Magro, G Piña, E Lara, L Sevilla</i>	1729
¹⁴ C Release from Steels under El Cabril Standard Leaching Test <i>José L Leganés, José V Muñoz, Carmen M García</i>	1743
IRRADIATED ZIRCALOYS	
Overview of ¹⁴ C Release from Irradiated Zircalloys in Geological Disposal Conditions <i>S Necib, C Bucur, S Caes, F Cochin, B Z Cvetković, M Fulger, J M Gras, M Herm, L Kasprzak, S Legand, V Metz, S Perrin, T Sakuragi, T Suzuki-Muresan</i>	1757
¹⁴ C Content in CANDU Spent Fuel Cladings and Its Release under Alkaline Conditions <i>C Bucur, M Fulger, I Florea, A Tudose</i>	1773
Release and Speciation of Carbon from Zircaloy-4 in Anaerobic and Highly Alkaline Conditions: Comparison of Simple Immersion and Potentiostatic Corrosion Tests <i>Sébastien Caes, Frank Druyts, Peter Thomas</i>	1787

SPENT ION-EXCHANGE RESINS

- ¹⁴C Content in CANDU Spent Ion Exchange Resins and Its Release under Alkaline Conditions
C Bucur, I Florea, P E Reiller, D Dumitrescu..... 1797
- Morphological Study of Ionic Exchange Resins to Support the ¹⁴C Release Investigation from Radioactive Wastes—Euratom CAST Project
A Rizzo, S Bruni, A Gessi, G Marghella, L Moretti, C Telloli, C Rizzato, A Luce..... 1809

IRRADIATED GRAPHITES

- ¹⁴C Release from TRIGA Irradiated Graphite
C Bucur, C Ichim, I Florea..... 1819
- Release of ¹⁴C and ³H from Irradiated Graphite of the Thermal Column of VVR-S Reactor to Solution Phase
Viorel Fugaru, Cristian Postolache, George Bubueanu, Catalin Tuta..... 1831
- Preliminary Investigation of ¹⁴C Migration from RBMK-1500 Reactor Graphite Disposed of in a Potential Geological Repository in Crystalline Rocks in Lithuania
Dalia Grigaliuniene, Povilas Poskas, Raimondas Kilda, Asta Narkuniene..... 1839
- Estimation of the Inventory of ¹⁴C and Other Key Radionuclides in Irradiated RBMK-1500 Graphite Based on Limited Measurements and Full 3D Core Modeling
Ernestas Narkunas, Povilas Poskas, Arturas Smaizys, Simon Norris..... 1849
- Investigation of Impurities of RBMK Graphite by Different Methods
Rita Plukienė, Elena Lagzdina, Laurynas Juodis, Artūras Plukis, Andrius Puzas, Rasa Gvozdaitė, Vidmantas Remeikis, Zsolt Révay, Jan Kučera, Darius Ancius, Danas Ridikas..... 1861
- ¹⁴C Leaching and Speciation Studies on Irradiated Graphite from Vandellós I Nuclear Power Plant
Enrique Magro, Eva María Márquez, Gabriel Piña, Marina Rodríguez, José Luís Gascón, Esperanza Lara, Lucía Sevilla..... 1871
- ¹⁴C and Other Radionuclides in Impermeable Graphite Material Waste Form Long Term Behavior
E Márquez, G Piña, J Fachinger, J L Leganés..... 1883

SAFETY ASSESSMENTS

- Preliminary Analysis of Gaseous Radiocarbon Behavior in a Geological Repository Hosted in Salt Rock
Riccardo Levizzari, Barbara Ferrucci, Alfredo Luce..... 1897
- ¹⁴C Exposure from Disposal of Radioactive Waste Compared to ¹⁴C Exposure from Cosmogenic Origin
Erika A C Neef..... 1911