



JBCS

Editors

Adriano L. Monteiro
Universidade Federal do Rio Grande do Sul
Brazil

Roberto M. Torresi
Universidade de São Paulo
Brazil

Jaísa Fernandes Soares
Universidade Federal do Paraná
Brazil

Solange Cadore
Universidade Estadual de Campinas
Brazil

Paulo Cezar Vieira
Universidade Federal de São Carlos
Brazil

Watson Loh (coordinator)
Universidade Estadual de Campinas
Brazil

Associate Editors

Brenno A. D. Neto
Universidade de Brasília
Brazil

Emanuel Carrilho
Universidade de São Paulo
Brazil

José Walkimar M. Carneiro
Universidade Federal Fluminense
Brazil

Teodoro S. Kaufman
Universidad Nacional de Rosario
Argentina

Edenir Rodrigues Pereira Filho
Universidade Federal de São Carlos
Brazil

Emerson F. Queiroz
Université de Genève
Switzerland

Márlia O. F. Goulart
Universidade Federal de Alagoas
Brazil

Vanessa Hatje
Universidade Federal da Bahia
Brazil

Eduardo Carasek da Rocha
Universidade Federal de Santa Catarina
Brazil

Humberto Osório Stumpf
Universidade Federal de Minas Gerais
Brazil

Pedro H. C. Camargo
Universidade de São Paulo
Brazil

Editorial Advisory Board

Antonio Canals
Universidad de Alicante
Spain

Eusébio Juaristi
Centro de Investigación y de Estudios Avanzados
del Instituto Politécnico Nacional - Mexico

Jailson B. de Andrade
Universidade Federal da Bahia
Brazil

Ludger Wessjohann
Leibniz Institute of Plant Biochemistry
Germany

Susan Lunte
University of Kansas
USA

António Joaquim de C. Varandas
Universidade de Coimbra
Portugal

Fernando Galembeck
Centro Nacional de Pesquisa em Energia e Materiais
Universidade Estadual de Campinas
Brazil

James Landers
University of Virginia
USA

Ralph E. Sturgeon
National Research Council Canada
Canada

Yvonne P. Mascarenhas
Universidade de São Paulo
Brazil

Eva M. Krupp
University of Aberdeen
UK

Henrique E. Toma
Universidade de São Paulo
Brazil

Juan Cesar Scaiano
University of Ottawa
Canada

Richard G. Weiss
Georgetown University
USA

Zhong-Qun Tian
Xiamen University
China

Editorial Manager: Angela Ramalho Custodio

Editorial Manager Assistants: Aya Hase and Maria Suzana Prata Vieira Francisco

Standard Reviewers: Cristina Battesini Adamo, Cristina Rodrigues Gabriel Sales,
Elaine Cristina Cabral, Telma Rie Doi Ducati

Founding Editor: Eduardo M. A. Peixoto

Former Editors: Angelo da Cunha Pinto[†], Armi W. da Nóbrega, Fernando Galembeck, Francisco Radler de Aquino Neto, Gerardo G. B. de Souza, Henrique E. Toma, Jailson B. de Andrade, Jaswant R. Mahajan, Joaquim A. Nóbrega, Koiti Araki, Luis A. Avaca, Luiz Carlos Dias, Luiz Carlos G. Freitas, Marco-Aurélio De Paoli, Maria D. Vargas, Maysa Furlan, Miguel Jafelicci Jr., Mônica Tallarico Pupo, Oswaldo L. Alves, Pedro J. M. Abreu, Ricardo Longo and Ronaldo A. Pilli.

Former members of the Advisory Board: Giuseppe Cilento[†], Jaswant R. Mahajan, Linus Pauling[†], Hitoshi Ohtaki, Isabella Karle, Klaus Hafner, Kozo Kuchitsu, Russell A. Bonham, Vicente G. Toscano, Jerome Karle, Henry Taube[†], Alejandro J Arvia, Clayton H. Heathcock, G. Jeffery Leigh, José Manuel Riveros, Otto Richard Gottlieb[†], Alberto Nuñez Sellés, C. N. R. Rao, Jean-Marie Lehn, José Luiz F. Costa Lima, Miguel de la Guardia and Roberto Sanchez-Delgado.

The *Journal of the Brazilian Chemical Society* is published once a month by PubliSBQ of the *Sociedade Brasileira de Química*.

SBQ Periodicals Coordinator: Adriano D. Andricopulo

Editorial and Publishing Office:

Instituto de Química, Universidade Estadual de Campinas, CP 6154, 13083-970 Campinas - SP, Brazil
Phone/Fax: +55 19 3521-3151; E-mail: office@jbcs.sbq.org.br

Subscriptions and Advertising Office:

Sociedade Brasileira de Química, CP 26037, 05513-970 São Paulo - SP, Brazil
Phone: +55 11 3032-2299; Fax: +55 11 3814-3602; E-mail: assinaturas@sbq.org.br

The *Journal of the Brazilian Chemical Society* serves its readers as a forum for information related to the advancement of Chemistry. The *Journal* is devoted to the publication of research papers in all fields of Chemistry, except education, philosophy and history of Chemistry

Information for authors: Full details of how to submit material for publication in the *Journal of the Brazilian Chemical Society* (online submission by ScholarOne platform) are given in the link **Instructions for Authors** <http://jbcs.sbq.org.br/instr.authors>

Galley proofs are sent by the Editorial Office to the author who submitted the manuscript. Proofs should be checked and returned as soon as possible (preferably within 48 hours)

Subscription Rates - 2016: Members of the Brazilian Chemical Society: R\$1200,00. Non-members and Institutions: R\$1500,00 (Brazil). Institutions (Latin Amer.): US\$520.00 and US\$660.00 (other countries). See also World Wide Web <http://www.sbq.org.br>

Back issues: Back issues of all previously published volumes are available directly from the Subscriptions Office

Creative Commons (CC) and iThenticate: Through SciELO (<http://www.scielo.org/php/index.php>), JBCS has adopted CC-BY license from the 26-9 issue on as the main role of the Open Access. Such license, already being used internationally by leading journals and open-access publishers, aims at maximizing the dissemination of articles. Also, has started to use the anti-plagiarism tool iThenticate, benefited from an agreement supported by the Brazilian Association of Scientific Editors (ABEC), at the end of 2015.

Copyright © 2016 Sociedade Brasileira de Química

It is a condition for publication that manuscripts submitted to this journal have not yet been published and will not be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the *Sociedade Brasileira de Química* (SBQ) if and when the article is accepted for publication. The copyright covers the exclusive rights to reproduce and distribute articles, including reprints, photographic reproductions, microform or any other reproductions of a similar nature, including translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, whether electronic, electrostatic or mechanical, nor by photocopying, recording, magnetic tape or otherwise, without written permission from the copyright holder.

While every effort is made by the SBQ, editors and editorial board to see that no inaccurate or misleading data, opinions or statements appear in this journal, they wish to make it clear that the contents of the articles and advertisements published herein are the sole responsibility of the contributors or advertisers concerned. Accordingly, the SBQ, the editorial board and editors and their respective employees, officers and agents accept no responsibility or liability whatsoever for the consequences of any such inaccurate or misleading data, opinion or statement.

Photocopying information for users in the USA. The Item-Fee Code for this publication indicates that authorization to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC). Transactional Reporting Service provided the stated fee for copying beyond that permitted by Section 107 and 108 of the United States Copyright Law is paid. The appropriate remittance of \$ 6.00 per copy per article is paid directly to the Copyright Clearance Center Inc., 222 Rosewood Drive, Danvers, MA 01923, USA

Permission for other use. The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific written permission must be obtained from the Publisher for such copying

The Item-Fee Code for this publication is: 0103-5053 \$6.00 + 0.00

Printed on acid-free paper

Indexed in the following databases: Science Citation Index[®], Science Citation Index expanded (SciSearch[®]), ISI Alerting Services, Chemical Abstracts-CA Plus, Chemistry Citation Index[®], Current Contents[®]/Physical, Chemical and Earth Sciences, IndexCopernicus, Portal de Periódicos da Capes, SciELO and SCOPUS

Financial support:



Printed in Brazil

Desktop Publishing: Hermans - Phone: +55 11 5571-8937

Printed by: Print Master - Phone: +55 19 3223-1044