



# JBCS

## Editors

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

**Jaísa Fernandes Soares**  
Universidade Federal do Paraná  
Brazil

**Joaquim A. Nóbrega**  
Universidade Federal de São Carlos  
Brazil

**Roberto M. Torresi**  
Universidade de São Paulo  
Brazil

**Watson Loh (coordinator)**  
Universidade Estadual de Campinas  
Brazil

---

## Associate Editors

**Eduardo Carasek da Rocha**  
Universidade Federal de Santa Catarina  
Brazil

**Emanuel Carrilho**  
Universidade de São Paulo  
Brazil

**Humberto Osório Stumpf**  
Universidade Federal de Minas Gerais  
Brazil

**José Walkimar M. Carneiro**  
Universidade Federal Fluminense  
Brazil

**Marília O. F. Goulart**  
Universidade Federal de Alagoas  
Brazil

**Mônica Tallarico Pupo**  
Universidade de São Paulo (FCFRP)  
Brazil

**Pedro J. M. Abreu**  
Universidade Nova de Lisboa  
Portugal

**Solange Cadore**  
Universidade Estadual de Campinas  
Brazil

**Teodoro S. Kaufman**  
Universidad Nacional de Rosario  
Argentina

**Vanessa Hatje**  
Universidade Federal da Bahia  
Brazil

---

## Editorial Advisory Board

**Alberto Nuñez Sellés**  
Center of Pharmaceutical Chemistry  
Cuba

**C. N. R. Rao**  
J. N. C. for Advanced Scientific Research  
India

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

**Fernando Galembeck**  
Universidade Estadual de Campinas  
Brazil

**Henrique E. Toma**  
Universidade de São Paulo  
Brazil

**Jean-Marie Lehn**  
Université Louis Pasteur  
France

**José Luiz F. Costa Lima**  
Universidade do Porto  
Portugal

**Miguel de la Guardia**  
Universidad de Valencia  
Spain

**Richard G. Weiss**  
Georgetown University  
USA

**Roberto Sanchez-Delgado**  
Brooklyn College  
USA

---

**Editorial Manager:** Angela Ramalho Custodio

**Editorial Manager Assistants:** Aya Hase, Maria Suzana Pratavieira Francisco,  
Telma Rie Doi Ducati and Laís Calixto S. Sipahi

**Founding Editor:** Eduardo M. A. Peixoto

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

**Former members of the Advisory Board:** Giuseppe Cilento<sup>†</sup>, Jaswant R. Mahajan, Linus Pauling<sup>‡</sup>, Hitoshi Ohtaki, Isabella Karle, Klaus Hafner, Kozo Kuchitsu, Russell A. Bonham, Vicente G. Toscano, Jerome Karle, Henry Taube<sup>‡</sup>, Alejandro J Arvia, Clayton H. Heathcock, G. Jeffery Leigh, José Manuel Riveros and Otto Richard Gottlieb<sup>‡</sup>.

The *Journal of the Brazilian Chemical Society* is published once a month by the *Sociedade Brasileira de Química (Brazilian Chemical Society)*.  
**SBQ Periodicals Coordinator:** Vitor Francisco Ferreira

**Editorial and Publishing Office:**

Instituto de Química, Universidade Estadual de Campinas, CP 6154, 13083-970 Campinas - SP, Brazil  
Tel/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  
Tel: +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 only) 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 - 2014.** Members of the Sociedade Brasileira de Química (Brazilian Chemical Society): R\$105,00 (Brazil) and US\$95 (other countries). Non-members: R\$285,00 (Brazil), US\$95 (Latin America) and US\$150 (other countries). Institutions: R\$285,00 (Brazil) and US\$260 (other countries). See also World Wide Web <http://www.sbq.org.br/assinatura.php>

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

Copyright © 2014 Sociedade Brasileira de Química (Brazilian Chemical Society)

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: Hermano - Phone: +55 11 5571-8937

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