

**A N A L E L E**  
**U N I V E R S I T Ă Ţ I I**  
**“O V I D I U S”**  
**C O N S T A N Ţ A**

Seria:  
**CHIMIE**

**OVIDIUS UNIVERSITY ANNALS OF CHEMISTRY**

**VOL.XXIII**

**YEAR XXIII - 2012, Number 2**

*Special Edition for the International Conference “CHIMIA 2012 – New  
Trends in Applied Chemistry”  
24-26 May 2012, Constanta, Romania*

**Indexed in Chemical Abstracts starting with 2008**  
**CODEN AUOCCG**

**Indexed in Index Copernicus starting with 2009 (IC value in 2010: 4.76)**

**Free online access to full papers starting with 2009:**  
**<http://www.univ-ovidius.ro/anale-chimie>**

**ISSN – 1223 – 7221**

## ANALELE UNIVERSITĂȚII "OVIDIUS" CONSTANȚA Seria CHIMIE "OVIDIUS" UNIVERSITY ANNALS OF CHEMISTRY

### AIMS AND SCOPE

Revista "Analele Universității Ovidius" Constanța seria Chimie este o revistă bianuală cu referenți care publică lucrări originale conținând rezultate nepublicate în alte reviste. Lucrările trebuie prezentate în limba engleză.

"Ovidius University Annals of Chemistry" is a national journal that appears in two issues per year and publishes reviewed original papers in all branches of fundamental and applied chemistry: inorganic, organic, analytical, food, biochemistry, physical chemistry, petroleum technology, chemical process engineering, environmental protection technologies, education in chemistry and environment protection.

### EDITOR IN CHIEF

**Elisabeta CHIRILĂ**

Mail address: "Ovidius" University, Faculty of Physics, Chemistry, Electronics and Petroleum Technology, Department of Chemistry, 124, Mamaia Blvd., 900527 RO Constanța, Romania; e-mail: echirila@univ-ovidius.ro; echirila@yahoo.com.

### ASSOCIATE EDITOR

**Gabriela STANCIU**, e-mail: gstanciu@univ-ovidius.ro.

### EDITOR ASSISTANT

**Simona LUPSOR** e-mail: sgutaga@univ-ovidius.ro.

### EDITORIAL ADVISORY BOARD

ANDRUH Marius, University of Bucharest, RO (Inorganic Chemistry);

BARBOSA TORRALBO Jose, University of Barcelona, ES (Analytical Chemistry)

BIRGHILA Semaghiul, "Ovidius" University of Constanța, RO (Analytical and Food Chemistry).

CHIRILĂ Elisabeta, "Ovidius" University of Constanța, RO (Analytical and Environmental Chemistry).

CLARK Andrew, University of Warwick, Coventry, UK (Organic Chemistry)

DOBRINAS Simona "Ovidius" University of Constanța, RO (Analytical and Food Chemistry).

DRAGHICI Camelia Lucia, Transilvania University of Brasov, RO (Analytical Chemistry)

DUMBRAVA Anca, "Ovidius" University of Constanța, RO (Inorganic Chemistry);

GIROTTI Stefano, University of Bologna, IT (Analytical and Environmental Chemistry);

KONCSAG Claudia Irina, University of Constanța, RO (Chemical Technology);

POPESCU Viorica, "Ovidius" University of Constanța, RO (Physical Chemistry);

NICOLAU Anca, Dunarea de Jos University of Galati, RO (Food Safety);

NITA Irina "Ovidius" University of Constanța, RO (Physical Chemistry);

POPOVICI (CARAZEANU) Ionela "Ovidius" University of Constanța, RO (Inorganic Chemistry);

ROȘCA Sorin "Politehnica" University of Bucharest, RO (Organic Chemistry);

SCHOONMAN Joop, Delft University of Technology, NL (Inorganic Chemistry);

STANCIU Gabriela "Ovidius" University of Constanța, RO (Organic Chemistry);

UNGUREANU Eleonora Mihaela, "Politehnica" University of Bucharest, RO (Physical Chemistry);

### ORDERING INFORMATION

Revista poate fi procurată prin schimb de publicații cu instituții similare din țară și străinătate;

The journal may be obtained on exchange basis with similar Romanian or foreign institutions;

**124, Mamaia Blvd, 900527 – RO Constantza, ROMANIA**

© 2012 Ovidius University Press. All rights reserved.

Printed in Romania

This journal and the individual contributions contained in it are protected under copyright by Ovidius University Press and the following terms and conditions apply to their use:

Single photocopies of single articles may be made for personal use as allowed by national copyright laws. Permission of the Publisher and payment of a fee is required for all other photocopying, including multiple or systematic copying. Permissions may sought directly from Ovidius University Press, 124 Mamaia Blvd, 900527 RO Constanța, Romania

**INTERNATIONAL CONFERENCE “CHIMIA 2012”,**  
May, 24 - 26 2012, Constanta, ROMANIA “NEW TRENDS IN APPLIED CHEMISTRY”

**SCIENTIFIC COMMITTEE**

ALEXE Petru, Dunarea de Jos University Galati, RO  
BARBOSA Jose, University of Barcelona, ES  
BRANDOLINI Vincenzo, University of Ferrara, IT  
CLARK Andrew, University of Warwick, Coventry, UK  
CHIRILA Elisabeta, Ovidius University, Constanta, RO  
DUTA Anca, Transilvania University, Brasov, RO  
GIROTTI Stefano, University of Bologna, IT  
JINESCU Gheorghita, Politehnica University, Bucharest, RO  
KONCSAG Claudia Irina, Ovidius University, Constanta, RO  
MAMALIGA Ioan, “Gheorghe Asachi” Technical University of Iasi, RO  
MEDVEDOVICI Andrei Valentin, University of Bucharest, RO  
NICOLAU Anca, Dunarea de Jos University Galati, RO  
RADU Gabriel Lucian, Politehnica University, Bucharest, RO  
ROSCA Sorin, Politehnica University, Bucharest, RO  
SCHOONMAN Joop, TU Delft, NL  
STANCIU Gabriela, Ovidius University, Constanta, RO  
UNGUREANU Eleonora Mihaela, Politehnica University, Bucharest, RO

**NATIONAL ORGANIZING COMMITTEE**

**Chairpersons:**

Danut Tiberius EPURE, Rector, Ovidius University of Constanta, RO  
Gabriela STANCIU, Ovidius University of Constanta, RO

**Members:**

BARBES L., Ovidius University of Constanta, RO  
BIRGHILA S., Ovidius University of Constanta, RO  
CHIRILA E., Ovidius University of Constanta, RO  
CHIS T. V., Ovidius University of Constanta, RO  
CONDREA E., Ovidius University of Constanta, RO  
DOBRINAS S., Ovidius University of Constanta, RO  
DRAGHICI C., Transilvania University of Brasov, RO  
DUMBRAVA A., Ovidius University of Constanta, RO  
DUMITRU A. I., Ovidius University of Constanta, RO  
KONCSAG C.I., Ovidius University of Constanta, RO  
LUPSOR S., Ovidius University of Constanta, RO

MATEI N., Ovidius University of Constanta, RO  
NEAGU A., Ovidius University of Constanta, RO  
NITA I., Ovidius University of Constanta, RO  
POPESCU V., Ovidius University of Constanta, RO  
POPOVICI I., Ovidius University of Constanta, RO  
SOCEANU A., Ovidius University of Constanta, RO  
STERPU A. E., Ovidius University of Constanta, RO

**Secretariat**

DOBRINAS S., Ovidius University of Constanta, RO  
BARBES L., Ovidius University of Constanta, RO  
TEODORESCU C., Ovidius University of Constanta, RO  
STERPU A. E., Ovidius University of Constanta, RO  
LUPSOR S., Ovidius University of Constanta, RO