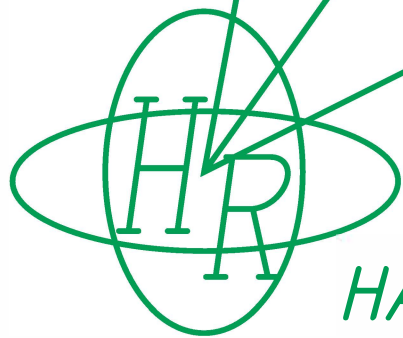


*POLISH*

*JOURNAL OF ENVIRONMENTAL  
STUDIES*



*HARD OLSZTYN*

**Vol. 29, No. 5, 2020**

# POLISH JOURNAL OF ENVIRONMENTAL STUDIES

EDITOR

**JERZY RADECKI**

EXECUTIVE EDITORS:

**HANNA RADECKA**

**DOROTA RADECKA**

ASSOCIATE EDITOR

**DAVID GONNERMAN**

EDITORIAL BOARD:

**IMRAN ALI**

Southwest University of Science and  
Technology, Mianyang, China

**IRENA BARANOWSKA**

Polytechnic of Silesia, Gliwice, Poland

**LIGITA BALEŽENTIENĖ**

Vytautas Magnus University, Kaunas  
district, Lithuania

**JAN BOGACKI**

Warsaw University of Technology, Poland

**BOGUSŁAW BUSZEWSKI**

Nicolaus Copernicus University, Toruń,  
Poland

**MEHMET CETIN**

Kastamonu University, Kastamonu,  
TURKEY

**LUKASZ CHRZANOWSKI**

Poznań University of Technology, Poland

**JAN DERCO**

Slovak University of Technology,  
Bratislava, Slovakia

**JAN DOBROWOLSKI**

AGH University of Science and  
Technology, Kraków, Poland

**HÉCTOR FERNÁNDEZ**

Universidad Nacional De Rio Cuarto,  
Departamento de Quimica, Rio Cuarto,  
Argentina

**S. J. S. FLORA**

National Institute of Pharmaceutical  
Education and Research (NIPER),  
INDIA

**EWA FLOREK**

University of Medical Sciences, Poznań,  
Poland

**MAGDALENA GANTNER**

Warsaw University of Life Sciences, Poland

**JANINA GOSPODAREK**

University of Agriculture, Cracow, Poland

**MARIA HEPEL**

Potsdam College, The State University  
of New York, USA

**PIOTR HERBUT**

University of Agriculture, Cracow, Poland

**YUH-SHAN HO**

College of Environmental Sciences, Peking  
University, Beijing, People's Republic  
of China

**MIROSLAV HUTNAN**

Slovak University of Technology, Slovakia

**DANA - ADRIANA ILUTIU - VARVARA**

Technical University of Cluj – Napoca,  
Romania

**MUNAWAR IQBAL**

University of Lahore, Lahore, Pakistan

**HARRY D. KAMBEZIDIS**

National Observatory of Athens, Greece

**HANNA KLIKOCA**

University of Life Sciences in Lublin,  
Poland

**MONIKA KOWALSKA-GÓRALSKA**

Institute of Biology, Wrocław, Poland

**ANNA KOZAK**

Adam Mickiewicz University in Poznań,  
Poland

**MALGORZATA KRZYWONOS**

Wrocław University of Economics, Poland

**JAN KUCHARSKI**

University of Warmia and Mazury  
in Olsztyn, Poland

**E. KUDJO DZANTOR**

Tennessee State University, USA

**ROBERTO LAI**

University of Sassari, Italy

**ULRICH LÜTTGE**

Institute of Botany, TH Darmstadt,  
Germany

**GRZEGORZ MAJ**

University of Life Sciences in Lublin,  
Poland

**SHELLEY MINTER**

University of Utah, Department of  
Chemistry, Salt Lake City, USA

**JACEK NAMIESNIK**

Chemical Faculty, Gdansk University  
of Technology, Poland

**CEMILE OZCAN**

Kirklareli University, TURKEY

**DAINIUS PALIULIS**

Vilnius Gediminas Technical University,  
Lithuania

**MARIUSZ PELECHATY**

University of Adam Mickiewicz, Poznań,  
Poland

**FÁBIO PORTELLA**

Federal University of Pernambuco, Recife,  
Brazil

**FERNANDO PORTO**

Federal Rural University of Pernambuco,  
Recife, Brazil

**BALTRENAS PRANAS**

Vilnius Gediminas Technical University  
(VGTU), Lithuania

**STANISŁAW PRZESTALSKI**

University of Agriculture, Wrocław, Poland

**MAHMOOD QAISAR**

COMSATS University Abbottabad,  
Pakistan

**GUNNO RENMAN**

Royal Institute of Technology, Stockholm,  
Sweden

**ROBERTO RICO-MARTÍNEZ**

Autonomous University of Aguascalientes,  
Aguascalientes, Mexico

**JERZY SIEPAK**

University of Adam Mickiewicz, Poznań,  
Poland

**PEDRO SIMÕES**

CERIS-IST, University of Lisbon, Portugal

**MITSUYUKI SOMA**

University of Shizuoka, Shizuoka 422,  
Japan

**AGATA SZYMAŃSKA-PULIKOWSKA**

University of Life Sciences in Wrocław,  
Poland

**YUKINORI TANI**

University of Shizuoka, Japan

**CEM TOKATLI**

Trakya University, Ipsala Vocational  
School, Edirne – Turkey

**ASHOK VASEASHTA**

U.S. Department of State, Washington,  
USA

**CARLOS EDUARDO FRONTANA  
VÁZQUEZ**

Centra de Investigacion y Desarrollo  
Tecnologico en Electroquimica, Cideteq,  
SC, Queretaro, Mexico

**HEINZ-RUDOLF VOIGT**

University of Helsinki, Finland

**JAN VYMAZAL**

Czech University of Life Sciences Prague,  
Czech Republic

**AMIR WASEEM**

Quaid-i-Azam University, Islamabad-  
45320, Pakistan

**AGNIESZKA WOLIŃSKA**

The John Paul II (The Second) Catholic  
University of Lublin, Poland

## NOTES TO AUTHORS

The following types of articles will be published:

- Full length research paper – describing original research;
- Short Communication – short research articles intended to present exciting findings that will have a major impact in environmental science;
- Reviews – should be a critical evaluation of the current stage of research on a particular environmental problem;
- Invited accelerated articles – stimulating the up-to-date research;

The submitted manuscripts, which must not have been published elsewhere, will be reviewed by The Editorial Board Members of the “Polish Journal of Environmental Studies,” assisted by Referees.

Authors of papers involving experiments with animals are requested to include the opinion and approval of Local Committee of Ethics.

### The recommended order of presentation

- **Title.**
- Author's name and affiliations, e-mail address.
- **Abstract.** An abstract stating the results and the novel aspects of the work and findings.
- **Keywords.** Up to 5 keywords or key phrases, indicating the topic of importance in the work.
- **Introduction.** An introductory statement of the subject under investigation with any essential historical background.
- **Experimental Procedures.** Working details must be given concisely; well-known operations should not be described in detail.
- **Results.** These could be presented in tabular or graph form, with appropriate statistical evaluation.
- **Discussion of Results.** The consolidation of the study and general implications should be presented and discussed with up-to-date scientific literature.
- **Conclusions.** Should include significance of the findings and recommendations for future work.
- **Acknowledgements.**
- **Units and Nomenclature.** The SI system of units and current internationally recognized (IUPAC) chemical nomenclature should be used. Common trivial names may be used, but should first be defined in terms of IUPAC nomenclature.
- **References** should be indicated in the text by consecutive numbers and the full references should be listed in the same order at the end of the article in the following form:

## References

1. KŁOS-WITKOWSKA A. Enzyme-based fluorescent biosensors and their environmental, clinical and industrial applications. *Pol. J. Environ. Stud.* **24**(1), 19, **2015**.
2. CHEN T. Y., LAI P. Y. A comparative study of energy utilization efficiency between Taiwan and China. *Energ. Policy.* **38** (5), 2386, **2010**.
3. HEPPEL M., ZHONG C. J. Functional nanoparticles for bioanalysis, nanomedicine and bioelectronics devices. ACS symposium series; 1112, USA, **2012**.

### The following parameters should be used for manuscript preparation:

- Spacing 1.5, font size 12, and a margin of 2.5 cm on all four sides of the paper
- Tables and figures should be included after references
- The most popular word processor file formats are recommended

### Proofs

Proofs should be carefully checked by corresponding Author and returned on time to Editors.

### On-line manuscript submission

Please create an account and log in at:

**[www.editorialsystem.com/pjoes](http://www.editorialsystem.com/pjoes)**

In the case of any problem, please do not hesitate to contact with us via e-mail:

[office@pjoes.com](mailto:office@pjoes.com)

After submission, each manuscript will be assigned an editorial number that authors should use in all correspondence with journal staff.

### Payment

The price of publishing in “Polish Journal of Environmental Studies” is **33 EURO +0% VAT** and **132 PLN +8% VAT** per one page of manuscript for foreign and Polish Authors, respectively. Each Figure and each Table is considered as one page of manuscript. The price includes high quality PDF of article, which will be send to corresponding Author.

***In the 2018 Journal Citation Reports:  
– Impact Factor: 1.186***

ISO Abbrev. Title: Pol. J. Environ. Stud.

*The “Polish Journal of Environmental Studies” is indexed and abstracted in: Chemical Abstracts; Ulrich's International Periodicals Directory; R.R., Bowker; USA; CAB International, Oxon, U.K.; Environmental Abstracts, Congressional Information Service, Maryland, USA; Zoological Record-BIOSIS, U.K.; International Soil Reference and Information Centre, the Netherlands; AGRIS FAO – Central Agricultural Library; Warsaw, Poland; Current Contents/Agriculture; Biology and Environmental Sciences; Sciences Citation Index Expanded; EBSCO Information Services; ELSEVIER Bibliographic Databases; AGRO Data Bases.*

**Visit us at: <http://www.pjoes.com>  
Our e-mail: [officehard@pjoes.com](mailto:officehard@pjoes.com)**

## SUBSCRIPTION INFORMATION

"Polish Journal of Environmental Studies"  
(ISSN 1230-1485)  
is published bimonthly since 1996.  
Subscription rates for Volume 29 (2020) are:  
Institutions: 144 EURO + 0% VAT  
(six issues per year)  
Individuals: 48 EURO + 0% VAT  
(six issues per year)

## ORDER FORM of "Polish Journal of Environmental Studies"

Volume:  
Year:  
Number of issues:  
Institution:  
- name  
- address  
- VAT number

Please send the order to:  
"Polish Journal of Environmental Studies"  
"HARD" Publishing Company  
Post-Office Box 6  
10-718 OLSZTYN 5, POLAND  
tel. (48-89) 523-46-36  
fax: (48-89) 524-01-24  
e-mail: officehard@pjoes.com

Method of payment:  
Please send payments to the account of  
Polska Kasa Opieki S.A., Oddział Olsztyn, Poland  
number: **PL 19124015901111000014317981**  
SWIFT: PKOPPLPW

**ISSN 1230-1485**

## INFORMACJE O PRENUMERACIE

„Polish Journal of Environmental Studies”  
(ISSN 1230-1485)  
jest dwumiesięcznikiem od 1996 roku.  
Roczna prenumerata tomu 29 (2020) wynosi dla:  
Instytucji: 180 PLN + 8% VAT (6 numerów w roku)  
Indywidualnych odbiorców: 72 PLN + 8% VAT  
(6 numerów w roku)

## FORMA ZAMÓWIENIA PRENUMERATY „Polish Journal of Environmental Studies”

Numer tomu:  
Rok:  
Ilość egzemplarzy:  
Instytucja zamawiająca:  
- Nazwa  
- Adres  
- Nr NIP

Zamówienie należy przesłać na adres:  
„Polish Journal of Environmental Studies”  
Redakcja HARD Publishing Company  
Przegródka pocztowa 6  
10-718 OLSZTYN 5  
tel. (48-89) 523-46-36  
fax: (48-89) 524-01-24  
e-mail: officehard@pjoes.com

Sposób opłacenia:  
Proszę przekazać opłatę na rachunek  
Polska Kasa Opieki S.A., Oddział Olsztyn  
numer: **19124015901111000014317981**