DESCRIPTION

The Chemical Engineering Journal focuses upon three aspects of chemical engineering: chemical reaction engineering, environmental chemical engineering, and materials synthesis and processing.

The Chemical Engineering Journal is an international research journal and invites contributions of original and novel fundamental research. The journal aims to provide an international forum for the presentation of original fundamental research, interpretative reviews and discussion of new developments in chemical engineering. Papers which describe novel theory and its application to practice are welcome, as are those which illustrate the transfer of techniques from other disciplines. Reports of carefully executed experimental work, which is soundly interpreted are also welcome. The overall focus is on original and rigorous research results which have generic significance.

Within the Chemical Engineering Journal, the Environmental Chemical Engineering section presents papers dealing with emerging topics in environmental chemical and process engineering, including pollution control, separation processes, advanced oxidation processes, adsorption of contaminants, resources recovery, waste-to-energy, environmental nanotechnology and bioprocesses, CO2 capture and utilization, and micro(nano) plastic detection and remediation.

Within the Chemical Engineering Journal, the Chemical Reaction Engineering section presents papers on a wide range of topics including reaction kinetics, simulation and optimization of different types of reactors, unsteady-state reactors, multiphase reactors, and process intensification including fundamental investigations of the processes of heat, mass and momentum transfer that take place along with chemical reactions. Innovative research works addressing critical areas of reactor engineering (e.g. novel reactor designs and materials, reactor safety and environmental issues), and emerging reactor technologies (e.g. membrane reactors, chromatographic reactors, unconventional fluidized bed reactors, electrochemical reactors, micro-reactors, photoreactors, fuel-cells, enzymatic reactors, etc.) are particularly welcome. Submissions based entirely on e.g., numerical simulations with commercial CFD codes without novel experimental validation; novel sensing devices without a component of reaction engineering; theoretical mathematics; combustion in the context of energy conversion; or straightforward bioreactor applications (bacteria or animal cells) are highly discouraged, as these will find better fit in other existent journals.

Within the Chemical Engineering Journal, the Novel Materials for Energy and Advanced Applications section presents papers dealing with different aspects of the preparation and characterization of advanced materials designed for specific applications. This section represents the evolution of the highly successful Materials Synthesis and Processing section whose scope has
been redefined to emphasize the design and application of materials in a number of fields, with energy (harvesting, storage, utilization) occupying a prominent but not exclusive role; manuscripts demonstrating applications of novel materials across multiple fields are welcomed. Manuscripts describing novel methods of synthesis as well as the processes used to obtain materials with different morphologies and/or modify the surface and structural properties of those materials will be considered provided the manuscript is written from a chemical engineering point of view. Manuscripts dealing with micro- and nano-structured materials and/or describing the preparation of composite and hybrid materials with advanced properites are particularly welcome. Given the applied character of the CEJ, we will consider manuscripts where specific applications are demonstrated for the materials synthesized.

Comments and Proposals: We are interested in receiving comments/feedback on this and our other journals and welcome publication proposals for books, electronic products, new journals and cooperation for existing journals.

AUDIENCE

Chemical and Process Engineers, Applied Chemists and Product Engineers, Biochemical Engineers and Biotechnologists.

IMPACT FACTOR

2018: 8.355 © Clarivate Analytics Journal Citation Reports 2019

ABSTRACTING AND INDEXING

BIOSEP Bulletin
BIOSIS Citation Index
Cambridge Scientific Abstracts
Chemical Abstracts
Chemical Engineering Abstracts
Current Contents
Engineered Materials Abstracts
Fluid Abstracts
INSPEC
Material Business Alerts
Metals Abstracts
Mixing and Separation Technology Abstracts
Scopus

EDITORIAL BOARD

Co-Editors
Stephen Allen, Queen's University Belfast, Belfast, United Kingdom
Dionysios Dionysiou, University of Cincinnati, Cincinnati, Ohio, United States
Advanced oxidation technologies for water treatment, drinking water treatment and purification, water quality, treatment, reuse, and monitoring, sustainable water processes, physicochemical phenomena on particle-water interfaces, transition-metal oxidation and reverse electron transfer reactions, destruction of biological toxins in water, environmental nanotechnology, Remediation, Environmental catalysis.
Guy Marin, Ghent University, Gent, Belgium
chemical kinetics; heterogeneous catalysis; (petro)chemical processes, polymerization, reactor design and modelling, reactor scale-up, crude oil refining, natural gas valorisation, renewables
King-Lun Yeung, Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong
heterogeneous catalysis (including environmental catalysis, photocatalysis and enzyme), novel and hybrid reactor system, miniature flow reactor and microreactor, green and fine chemistry.
Tejraj (Bhavi) Aminabhavi, Soniya Education Trust's College of Pharmacy, Dharwad, India
Sustainable environmental membrane separation processes, Emerging pollutant separation and solid waste mitigation, MBR and forward osmosis for biowaste mitigation, Effluent or influent wastewater treatment by electro-coagulation, Toxic metal separation and recovery, Desulfurization, Acid/flue gas separation

Theophilos Ioannides, Institute of Chemical Engineering Sciences, Patra, Greece
Catalytic reaction engineering, Functional nanomaterials, ((electro)chemical) energy storage

Dimitris Kondarides, University of Patras Department of Chemical Engineering, Patras, Greece
Heterogeneous catalysis and photocatalysis. Development and evaluation of catalytic materials and processes for environmental and energy-related applications

Nuno Reis, University of Bath, Bath, United Kingdom
Micro-reactor technology, fluid mechanics, CFDs, gas-liquid mixing, multiphase reactors, process intensification, biological reactors, biofuels

Todd Hoare, McMaster University, Hamilton, Ontario, Canada
Biomaterials, Drug delivery systems, Tissue engineering scaffolds, Encapsulation methods, Hydrogels, Functional polymers and polymer composites, Superhydrophobic/superoleophobic interfaces, Oil recovery materials, fire retardant materials, phase change and thermal management materials, antibacterial/antifungal materials and interfaces, anti-corrosion materials, biosensors

Reviews & Perspectives Editor

Jesús Santamaria, University of Zaragoza, Zaragoza, Spain
Nanomaterials synthesis and characterization, Nanomedicine, catalysis, advanced reactors (microwave-driven reactors, microreactors, laser pyrolysis reactors)

Associate Editors

Carolina Belver, Autonomous University of Madrid, Madrid, Spain
Water purification by photocatalysis, Design of novel heterostructures for environmental remediation, Water treatment by adsorption, Advanced oxidation technologies for water treatment, Environmental nanotechnology (fundamental and applications of nanomaterials).

Soryong (Ryan) Chae, University of Cincinnati, Cincinnati, Ohio, United States
Biological processes for water recycling and reuse, Resource recovery, Membrane technology for water quality and energy, Environmental nanotechnology

Bin Gao, University of Florida, Gainesville, Florida, United States
Biochar technology, Environmental nanotechnology, Contaminant fate and transport, Adsorption, Engineered carbon materials, Nutrient removal and reuse, Heavy metal removal, Removal of emerging contaminants, Controlled release fertilizers

Hrvoje Kušić, University of Zagreb Faculty of Chemical Engineering and Technology, Zagreb, Croatia
Advanced oxidation technologies for water treatment, (photo)Fenton processes, persulfate based processes, photocatalysis, solar-active materials, process simulation and optimization, mechanistic/phenomenological modeling, QSA/PR modeling

Eilhann Kwon, Sejong University Department of Energy and Environment, Seoul, Korea, Republic of Waste-to-Energy (WtE), Combustion chemistry, Thermo-chemical processes (pyrolysis and gasification), Catalysis, Biofuels, Biorefinery, CO2 utilization, Carbon capture and storage (CCS), Waste and biomass valorization, Green chemistry, Environmental sustainability, Air pollution controls

Yuekun Lai, Fuzhou University, College of Chemical Engineering, Fuzhou, China
Bioinspired functional surfaces with special wettability (superhydrophobicity/hydrophilicity), Water-oil separation and purification, self-cleaning and antifogging coatings, photo(electro)catalysis, water splitting, functional membranes and fabrics, transparent multifunctional films, biomedical scaffolds, aerogel, sustainable chemical engineering processes, nanomaterials for environmental and energy-related applications

Urška Lavrenčič Štangar
Heterogenous photocatalysis in water and air, AOPs, self-cleaning and antifogging surfaces, wet chemistry synthesis of materials, materials characterization

Jinwoo Lee, Korea Advanced Institute of Science and Technology, Daejeon, Korea, Republic of Electrocataysts, Rechargeable Batteries, Nanostructure Material Synthesis, Heterogeneous catalysts, Mesoporous Materials.

Angeliki Lemonidou, Aristotle University of Thessaloniki, Thessaloniki, Greece
Heterogeneous catalysis, chemical kinetics, reactor design, (petro)chemical processes, carbon capture and utilization processes, process intensification (chemical looping), natural gas valorization, biomass chemo and thermocatalytic conversion.

Wen-Wei Li, University of Science and Technology of China Department of Chemistry, Hefei, China
Bioelectrochemical systems, Extracellular electron transfer, Photoelectrochemical/electrochemical process for pollutant degradation, Membrane-based water treatment process, Membrane fouling, Nanoparticles biosynthesis, Resource recovery from wastewater

**Eva Martin Del Valle**, University of Salamanca, Salamanca, Spain

**Bingcai Pan**, Nanjing University, Nanjing, China

Nano-enabled water treatment; Environmental functional materials; Nanomaterials for environmental remediation; Industrial wastewater treatment; Municipal wastewater treatment; Drinking water treatment; Adsorption; Advanced oxidation processes (AOPs); Water quality analysis; POPs and PPCPs removal

**Suresh C. Pillai**, Institute of Technology Sligo, Nanotechnology and Bio-Engineering Research Group, Sligo, Ireland


**Yiu Fai Tsang**, The Education University of Hong Kong, New Territories, Hong Kong

Wastewater and sludge treatment, Bioremediation/environmental bioprocesses, Resource recovery from organic waste, Microbial CO2 fixation, Microfibres and nanoplastics, Odour pollution control

**Jennifer Wilcox**, Worcester Polytechnic Institute, Worcester, Massachusetts, United States

Carbon Capture, Negative Emissions, Combustion, Adsorption, Membrane Separations

**Yusuke Yamauchi**, The University of Queensland School of Chemical Engineering, Brisbane, Queensland, Australia

Nanomaterials; Inorganic materials chemistry; Inorganic synthetic chemistry; Energy and environmental applications

**Aiping Yu**, University of Waterloo, Waterloo, Ontario, Canada

Nanomaterials development for polymer composites (thermal management, corrosion) and energy storage/conversion (supercapacitors, batteries, photocatalysts)

**Editorial Board**

**Bengt Andersson**, Chalmers University of Technology, Gothenburg, Sweden

**Vemuri Balakotaiah**

**Teresa Bandosz**, City University of New York, New York, New York, United States

New sorbents and catalysts, Surface characterization, Adsorption/desorption phenomena, Gas separation, Deep desulfurization of fuels, Catalytic photooxidation, Graphite oxide based composite, Gas sensors, Energy storage

**Jorge Bedia**, Autonomous University of Madrid, Chemical Engineering Department, Madrid, Spain

Carbon materials, Metal organic frameworks (MOFs), Catalysis, Advanced oxidation processes (AOPs), Ionic liquids

**Federico Bella**, Polytechnic of Turin, Torino, Italy

Solar cells, Batteries, Supercapacitors, Chemometrics, Circular economy

**Silvana Cardoso**, University of Cambridge Department of Chemical Engineering and Biotechnology, Cambridge, United Kingdom

Fluid Mechanics, Environment, Buoyancy, Plumes & Jets, Porous Media

**Raf Dewil**, KU Leuven Science and Technology Group Department of Chemical Engineering, Heverlee, Belgium

**Polycarpos Falaras**, Ethniko Kentro Ereunias Physikon Epistemion 'Demokritos', Athens, Greece

Functional molecular materials; Nanostructured semiconductors; Water purification; Photocatalytic reactors; Third generation solar cells

**Maohong Fan**, University of Wyoming School of Energy Resources, Laramie, Wyoming, United States

**Jorge Gascon**, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia

**Antoine Ghauch**, American University of Beirut, Beirut, Lebanon

Advanced Oxidation Technologies; Effluents Decontamination; Catalysis; Instrumental Analysis; Spectroscopy;

**Hans Kuipers**, University of Technology Eindhoven Department of Chemical Engineering and Chemistry, Eindhoven, Netherlands

Multiphase Reactors, Multiphase Flow, Computational Fluid Dynamics, Multi-Scale Modelling

**Gianluca Li Puma**, Loughborough University Department of Chemical Engineering, Loughborough, United Kingdom

Photocatalysis, Environmental nanocatalysis, Advanced oxidation processes, Environmental remediation, Solar energy conversion and Photoreaction engineering.

**Heng Liang**, Harbin Institute of Technology, School of Environment, Harbin, China

Membrane, Drinking water treatment; Water reuse; Advanced oxidation; Desalination

**Jun Ma**, Harbin Institute of Technology School of Municipal and Environmental Engineering, Harbin, China

**Dionisis Mantzavinos**, University of Patras Department of Chemical Engineering, Patras, Greece
Environmental catalysis; wastewater engineering; advanced oxidation processes; biological processes; process integration; reaction engineering; emerging micro-pollutants; waste valorization

**Malikarjuna N. Nadagouda**, National Risk Management Research Laboratory, Cincinnati, Ohio, United States

Advanced oxidation technologies (AOTs), Functional materials for environmental application, Electrocatalysis, Photocatalysis, Membrane separation

**Alexander Orlov**, Stony Brook University, Stony Brook, New York, United States

Environmental Catalysis, Materials Science, Environmental Engineering, Environmental Nanotechnology, Physical and Environmental Chemistry

**Xie Quan**, Dalian University of Technology School of Environmental Science and Technology, Dalian, China

Advanced oxidation technologies (AOTs), Functional materials for environmental application, Electrocatalysis, Photocatalysis, Membrane separation

**Zhiyong Jason Ren**, Princeton University, Princeton, New Jersey, United States

Water resource recovery, Wastewater treatment, Microbial electrochemistry, Functional membranes

**Alirio Rodrigues**, University of Porto, Porto, Portugal

Cyclic adsorption/reaction processes, Perfume Engineering, Lignin valorization, CO2 capture and utilization, Modeling and simulation

**Vicente Rodriguez Gonzalez**, Potosi Institute of Scientific and Technological Research, San Luis Potosi, Mexico

Photo-inactivation, Agricultural photocatalysis, H2 production, Hydrothermal method, Microwave synthesis

**Geoff STEVENS**, The University of Melbourne Department of Chemical Engineering, Parkville, Victoria, Australia

Separation Processes, Solvent Extraction, Ion Exchange

**Andreas Seidel-Morgenstern**, Otto von Guericke University, Magdeburg, Germany

Reaction Engineering, Forced Dynamic Operation, Chromatography, Crystallization

**Mahadevan Surianarayanan**, Central Leather Research Institute CSIR, Chennai, India

Environmental remediation/degradation of toxic chemicals, Membrane bioreactors for the treatment or separation of toxic/industrial effluents, Chemical process safety, Bioprocess monitoring and control through metabolic heats.

**Stanislaw Waclawek**, Institute for Nanomaterials Advanced Technology and Innovation, Liberec, Czech Republic

AOPs; nanomaterials; green chemistry; catalysis

**Laurence Russell Weatherley**, University of Kansas, Lawrence, Kansas, United States

Process intensification, Liquid-Liquid systems, Ion Exchange, Biocatalysis, Phase transfer catalysis

**Ruiyang (Ray) Xiao**, Central South University, Changsha, China

Advanced oxidation processes, Radical chemistry, Computational chemistry, Environmental modelling

**Xing-Gui Zhou**, East China University of Science and Technology, Shanghai, China
INTRODUCTION

Submission of Papers Manuscripts should be submitted to one of the following section Editors as defined in the journal Aims & Scope and according to the Editor’s specialties. If you are unsure about to whom you should submit a manuscript, please submit it to any Editor in the appropriate section.

Environmental Chemical Engineering:

Stephen Allen: Adsorption (liquid and gas); Ion exchange; Water treatment (physico/chemical methods); Air/gas treatment, NOx control, CO2 capture; Constructed wetlands and reed beds for water treatment; Agricultural wastes (liquid and solid); Solid waste treatment and bioconversion; Sustainable development or processes

Tejraj Aminabhavi: Environmental membrane filtration processes; Emerging pollutant separation and solid-waste minimization; Environmental pollution abatement; Effluent or influent treatment by electrocoagulation and membrane distillation; Toxic metal separation and recovery; Acid/flue gas separation; Desulfurization

Dionysios (Dion) Dionysiou: Advanced oxidation processes/technologies (AOPs/AOTs); Photocatalysis; Environmental catalysis ; Membranes processes; Electrooxidation, electrochemical methods ; Particle separation; Separation processes ; Environmental nanotechnology (focus on environmental remediation, environmental sensing)

Chemical Reaction Engineering:

Guy B. Marin: Chemical kinetics; heterogeneous catalysis; (petro)chemical processes, polymerization, reactor design and modelling, reactor scale-up, crude oil refining, natural gas valorisation, renewables

Nuno M. Reis: Micro-reactor technology, fluid mechanics, CFDs, gas-liquid mixing, multiphase reactors, process intensification, biological reactors, biofuels

King Yeung: Heterogeneous catalysis (including environmental catalysis, photocatalysis and enzyme), novel and hybrid reactor system, miniature flow reactor and microreactor, green and fine chemistry

Novel Materials for Energy and Advanced Applications:

Todd Hoare: Functional polymers and polymer nanocomposites; biomaterials and materials for biomedical applications; superhydrophobic/superwetting materials; flame retardant materials; corrosion inhibiting materials; novel encapsulation methods and applications

Dimitris I. Kondarides: Materials for energy storage devices (primary and secondary batteries; supercapacitors); materials for solar energy conversion and storage (photo(electro)catalytic water splitting, CO2 reduction, nitrogen fixation; dye-sensitized solar cells); energetic materials; electromagnetic wave absorbing materials; luminescent materials and phosphors

Reviews and Perspectives:

Jesus Santamaria: Submissions on Review Articles and Perspectives will be handled by Professor Santamaria.

Types of papers

The editors make every effort to ensure that manuscripts are fairly and independently reviewed. Submissions which describe novel theory and its application to practice are welcome, as are those which illustrate the transfer of techniques from other disciplines. Reports of carefully executed experimental work which is soundly interpreted are also
welcome. Manuscripts of routine studies, however, presenting experimental data but without any significant new interpretation or novelty, or that are very specific and applied in their scope, will be rejected by the editors as "lacking in novel content".

Original papers - these should be complete and authoritative accounts of work, which has a special significance and must be presented clearly and concisely.

Review articles - We expect our reviews to be authoritative pieces of work, aimed at describing recent progress in relevant research areas within the scope of the Journal, with the non-expert reader in mind. Rather than attempting a thorough review of the field, authors should concentrate on essential developments, to give a balanced account of the state of the art, discuss key results and provide insight on the perspectives for that research field. Prospective authors of a review article may consult with the Review Editor or one of the other Editors to check the suitability of their topic and material before submitting their review. To keep the review manuscripts concise and readable, as a general rule they should be limited to 10,000 words, 10 figures and up to 150 references.

Perspectives - Perspectives are a new type of contribution in the Chemical Engineering Journal. They are meant as short opinion papers addressing a key, often emerging, research area. They should balance the personal view of the author and a reasoned discussion of recent results of great importance. While they often examine the evolution of the field, they are not meant as a mini-review, but as a scholarly discussion that helps to identify new trends and developments in a given field. Perspective manuscripts should contain no more than 3000 words, up to three figures and 60 references. They are always commissioned by the Editor in charge.

Short communications - will be accepted for the early communication of important and original advances. Such accounts may be of a preliminary nature but should always be complete and should not exceed the equivalent of 3000 words, including figures and tables.

Letters to Editors - raise scientific or technical questions about a published article. They are typically no longer than 1000 words. These letters will be considered for publication only if they contribute an added value or special consideration to a specific article that has already published in the Chemical Engineering Journal. Letters-to-the-Editor should be submitted directly to the appropriate Editor by e-mail. Publication and/or peer review of submitted letters will occur solely at the Editors discretion. It should be noted that authors of the original research article will be given the opportunity to publicly respond to any Letter-to-the-Editor should it be accepted for publication.

Submission checklist
You can use this list to carry out a final check of your submission before you send it to the journal for review. Please check the relevant section in this Guide for Authors for more details.

Ensure that the following items are present:

One author has been designated as the corresponding author with contact details:
• E-mail address
• Full postal address

All necessary files have been uploaded:
Manuscript:
• Include keywords
• All figures (include relevant captions)
• All tables (including titles, description, footnotes)
• Ensure all figure and table citations in the text match the files provided
• Indicate clearly if color should be used for any figures in print

Graphical Abstracts / Highlights files (where applicable)
Supplemental files (where applicable)

Further considerations
• Manuscript has been ‘spell checked’ and ‘grammar checked’
• All references mentioned in the Reference List are cited in the text, and vice versa
• Permission has been obtained for use of copyrighted material from other sources (including the Internet)
• A competing interests statement is provided, even if the authors have no competing interests to declare
• Journal policies detailed in this guide have been reviewed
• Referee suggestions and contact details provided, based on journal requirements
BEFORE YOU BEGIN

Ethics in publishing
Please see our information pages on Ethics in publishing and Ethical guidelines for journal publication.

Declaration of interest
All authors must disclose any financial and personal relationships with other people or organizations that could inappropriately influence (bias) their work. Examples of potential conflicts of interest include employment, consultancies, stock ownership, honoraria, paid expert testimony, patent applications/registrations, and grants or other funding. Authors should complete the declaration of interest statement using this template and upload to the submission system at the Attach/Upload Files step. If there are no interests to declare, please choose: 'Declarations of interest: none' in the template. This statement will be published within the article if accepted. More information.

Submission declaration and verification
Submission of an article implies that the work described has not been published previously (except in the form of an abstract, a published lecture or academic thesis, see 'Multiple, redundant or concurrent publication' for more information), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder. To verify originality, your article may be checked by the originality detection service Crossref Similarity Check.

Preprints
Please note that preprints can be shared anywhere at any time, in line with Elsevier's sharing policy. Sharing your preprints e.g. on a preprint server will not count as prior publication (see 'Multiple, redundant or concurrent publication' for more information).

Use of inclusive language
Inclusive language acknowledges diversity, conveys respect to all people, is sensitive to differences, and promotes equal opportunities. Articles should make no assumptions about the beliefs or commitments of any reader, should contain nothing which might imply that one individual is superior to another on the grounds of race, sex, culture or any other characteristic, and should use inclusive language throughout. Authors should ensure that writing is free from bias, for instance by using 'he or she', 'his/her' instead of 'he' or 'his', and by making use of job titles that are free of stereotyping (e.g. 'chairperson' instead of 'chairman' and 'flight attendant' instead of 'stewardess').

Changes to authorship
Authors are expected to consider carefully the list and order of authors before submitting their manuscript and provide the definitive list of authors at the time of the original submission. Any addition, deletion or rearrangement of author names in the authorship list should be made only before the manuscript has been accepted and only if approved by the journal Editor. To request such a change, the Editor must receive the following from the corresponding author: (a) the reason for the change in author list and (b) written confirmation (e-mail, letter) from all authors that they agree with the addition, removal or rearrangement. In the case of addition or removal of authors, this includes confirmation from the author being added or removed.

Only in exceptional circumstances will the Editor consider the addition, deletion or rearrangement of authors after the manuscript has been accepted. While the Editor considers the request, publication of the manuscript will be suspended. If the manuscript has already been published in an online issue, any requests approved by the Editor will result in a corrigendum.

Copyright
Upon acceptance of an article, authors will be asked to complete a 'Journal Publishing Agreement' (see more information on this). An e-mail will be sent to the corresponding author confirming receipt of the manuscript together with a 'Journal Publishing Agreement' form or a link to the online version of this agreement.

Subscribers may reproduce tables of contents or prepare lists of articles including abstracts for internal circulation within their institutions. Permission of the Publisher is required for resale or distribution outside the institution and for all other derivative works, including compilations and translations. If
excerpts from other copyrighted works are included, the author(s) must obtain written permission from the copyright owners and credit the source(s) in the article. Elsevier has preprinted forms for use by authors in these cases.

For gold open access articles: Upon acceptance of an article, authors will be asked to complete an 'Exclusive License Agreement' (more information). Permitted third party reuse of gold open access articles is determined by the author's choice of user license.

Author rights
As an author you (or your employer or institution) have certain rights to reuse your work. More information.

Elsevier supports responsible sharing
Find out how you can share your research published in Elsevier journals.

Role of the funding source
You are requested to identify who provided financial support for the conduct of the research and/or preparation of the article and to briefly describe the role of the sponsor(s), if any, in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication. If the funding source(s) had no such involvement then this should be stated.

Open access
Please visit our Open Access page for more information.

Elsevier Researcher Academy
Researcher Academy is a free e-learning platform designed to support early and mid-career researchers throughout their research journey. The "Learn" environment at Researcher Academy offers several interactive modules, webinars, downloadable guides and resources to guide you through the process of writing for research and going through peer review. Feel free to use these free resources to improve your submission and navigate the publication process with ease.

Language (usage and editing services)
Please write your text in good English (American or British usage is accepted, but not a mixture of these). Authors who feel their English language manuscript may require editing to eliminate possible grammatical or spelling errors and to conform to correct scientific English may wish to use the English Language Editing service available from Elsevier's Author Services.

Submission
Our online submission system guides you stepwise through the process of entering your article details and uploading your files. The system converts your article files to a single PDF file used in the peer-review process. Editable files (e.g., Word, LaTeX) are required to typeset your article for final publication. All correspondence, including notification of the Editor's decision and requests for revision, is sent by e-mail.

Referees
Please submit the names and institutional e-mail addresses of several potential referees. For more details, visit our Support site. Note that the editor retains the sole right to decide whether or not the suggested reviewers are used.

Suggested reviewers must be supplied with complete contact details and e-mail addresses. Reviewers should be knowledgeable of the research area and must not have a conflict of interest. Do not list collaborators, colleagues, researchers at your institution, former advisors or advisees.

Additional information
Authors are required to submit a cover letter with each new submission to the journal. This cover letter should acknowledge that the author has consulted the Guide for Authors in preparing his or her submitted manuscript. The author must also confirm that he or she has prepared the manuscript in compliance with the Ethics in Publishing Policy as described in the Guide for Authors.

In preparing the cover letter, the author must also address the following points:
Author indication if manuscript is a re-submission Suggested reviewers with complete contact details and e-mail addresses. Do not list collaborators, colleagues, researchers at your institution, former advisors or advisees. Keywords are provided References are in correct format PDF of manuscript is in correct order upon submission Manuscript length is in compliance with the Guide for Authors

PREPARATION

Peer review
This journal operates a single blind review process. All contributions will be initially assessed by the editor for suitability for the journal. Papers deemed suitable are then typically sent to a minimum of two independent expert reviewers to assess the scientific quality of the paper. The Editor is responsible for the final decision regarding acceptance or rejection of articles. The Editor's decision is final. More information on types of peer review.

Language
All papers submitted to the journal should be written in good English. Authors for whom English is not their native language are encouraged to have their paper checked before submission for grammar and clarity. English language and copyediting services can be provided by: International Science Editing and Asia Science Editing. Please note Elsevier neither endorses nor takes responsibility for any products, goods or services offered by outside vendors through our services or in any advertising. For more information about language editing services please visit our Support Center.

Use of word processing software
It is important that the file be saved in the native format of the word processor used. The text should be in single-column format. Keep the layout of the text as simple as possible. Most formatting codes will be removed and replaced on processing the article. In particular, do not use the word processor's options to justify text or to hyphenate words. However, do use bold face, italics, subscripts, superscripts etc. When preparing tables, if you are using a table grid, use only one grid for each individual table and not a grid for each row. If no grid is used, use tabs, not spaces, to align columns. The electronic text should be prepared in a way very similar to that of conventional manuscripts (see also the Guide to Publishing with Elsevier). Note that source files of figures, tables and text graphics will be required whether or not you embed your figures in the text. See also the section on Electronic artwork.

To avoid unnecessary errors you are strongly advised to use the 'spell-check' and 'grammar-check' functions of your word processor.

Article structure

Subdivision - numbered sections
Divide your article into clearly defined and numbered sections. Subsections should be numbered 1.1 (then 1.1.1, 1.1.2, ...), 1.2, etc. (the abstract is not included in section numbering). Use this numbering also for internal cross-referencing: do not just refer to 'the text'. Any subsection may be given a brief heading. Each heading should appear on its own separate line.

Introduction
State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results.

Material and methods
Provide sufficient details to allow the work to be reproduced by an independent researcher. Methods that are already published should be summarized, and indicated by a reference. If quoting directly from a previously published method, use quotation marks and also cite the source. Any modifications to existing methods should also be described.

Results
Results should be clear and concise.

Discussion
This should explore the significance of the results of the work, not repeat them. A combined Results and Discussion section is often appropriate. Avoid extensive citations and discussion of published literature.

Conclusions
The main conclusions of the study may be presented in a short Conclusions section, which may stand alone or form a subsection of a Discussion or Results and Discussion section.
Appendices
If there is more than one appendix, they should be identified as A, B, etc. Formulae and equations in appendices should be given separate numbering: Eq. (A.1), Eq. (A.2), etc.; in a subsequent appendix, Eq. (B.1) and so on. Similarly for tables and figures: Table A.1; Fig. A.1, etc.

Essential title page information
• **Title.** Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible.
• **Author names and affiliations.** Please clearly indicate the given name(s) and family name(s) of each author and check that all names are accurately spelled. You can add your name between parentheses in your own script behind the English transliteration. Present the authors' affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lower-case superscript letter immediately after the author's name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name and, if available, the e-mail address of each author.
• **Corresponding author.** Clearly indicate who will handle correspondence at all stages of refereeing and publication, also post-publication. This responsibility includes answering any future queries about Methodology and Materials. **Ensure that the e-mail address is given and that contact details are kept up to date by the corresponding author.**
• **Present/permanent address.** If an author has moved since the work described in the article was done, or was visiting at the time, a 'Present address' (or 'Permanent address') may be indicated as a footnote to that author's name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript Arabic numerals are used for such footnotes.

Highlights
Highlights are mandatory for this journal as they help increase the discoverability of your article via search engines. They consist of a short collection of bullet points that capture the novel results of your research as well as new methods that were used during the study (if any). Please have a look at the examples here: example Highlights.

Highlights should be submitted in a separate editable file in the online submission system. Please use 'Highlights' in the file name and include 3 to 5 bullet points (maximum 85 characters, including spaces, per bullet point).

Abstract
A concise and factual abstract is required. (An approximate maximum of 250 words should be observed.) The abstract should state briefly the purpose of the research, the principal results and major conclusions. An abstract is often presented separately from the article, so it must be able to stand alone. For this reason, References should be avoided, but if essential, then cite the author(s) and year(s). Also, non-standard or uncommon abbreviations should be avoided, but if essential they must be defined at their first mention in the abstract itself.

Graphical abstract
Although a graphical abstract is optional, its use is encouraged as it draws more attention to the online article. The graphical abstract should summarize the contents of the article in a concise, pictorial form designed to capture the attention of a wide readership. Graphical abstracts should be submitted as a separate file in the online submission system. Image size: Please provide an image with a minimum of 531 x 1328 pixels (h x w) or proportionally more. The image should be readable at a size of 5 x 13 cm using a regular screen resolution of 96 dpi. Preferred file types: TIFF, EPS, PDF or MS Office files. You can view Example Graphical Abstracts on our information site. Authors can make use of Elsevier's Illustration Services to ensure the best presentation of their images and in accordance with all technical requirements.

Keywords
Immediately after the abstract, provide a maximum of 6 keywords, using American spelling and avoiding general and plural terms and multiple concepts (avoid, for example, 'and', 'of'). Be sparing with abbreviations: only abbreviations firmly established in the field may be eligible. These keywords will be used for indexing purposes.

Abbreviations
Define abbreviations that are not standard in this field in a footnote to be placed on the first page of the article. Such abbreviations that are unavoidable in the abstract must be defined at their first mention there, as well as in the footnote. Ensure consistency of abbreviations throughout the article.
Acknowledgements
Collate acknowledgements in a separate section at the end of the article before the references and do not, therefore, include them on the title page, as a footnote to the title or otherwise. List here those individuals who provided help during the research (e.g., providing language help, writing assistance or proof reading the article, etc.).

Formatting of funding sources
List funding sources in this standard way to facilitate compliance to funder's requirements:

Funding: This work was supported by the National Institutes of Health [grant numbers xxxx, yyyy]; the Bill & Melinda Gates Foundation, Seattle, WA [grant number zzzz]; and the United States Institutes of Peace [grant number aaaa].

It is not necessary to include detailed descriptions on the program or type of grants and awards. When funding is from a block grant or other resources available to a university, college, or other research institution, submit the name of the institute or organization that provided the funding.

If no funding has been provided for the research, please include the following sentence:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Math formulae
Please submit math equations as editable text and not as images. Present simple formulae in line with normal text where possible and use the solidus (/) instead of a horizontal line for small fractional terms, e.g., X/Y. In principle, variables are to be presented in italics. Powers of e are often more conveniently denoted by exp. Number consecutively any equations that have to be displayed separately from the text (if referred to explicitly in the text).

Footnotes
Footnotes should be used sparingly. Number them consecutively throughout the article. Many word processors can build footnotes into the text, and this feature may be used. Otherwise, please indicate the position of footnotes in the text and list the footnotes themselves separately at the end of the article. Do not include footnotes in the Reference list.

Artwork and figure for cover

Submission of figures for cover
Following the acceptance of your article, if you wish to have a figure or other illustration that is representative of your manuscript considered for possible inclusion on the journal cover, you must follow the instructions below no later than 10 days after the date of your acceptance letter:

Select your figure or artwork. You are encouraged to modify the figure with color or other enhancements. The figure must illustrate your work but does not need to be a figure exactly the same as it appears in the article. In general, submitted figures should be in full color, though exceptional black and white images will be considered. Graphs and charts will not generally be considered for the cover. Your chances of being selected will increase if the figure is enhanced to make it more attractive. Please also include with the figure some descriptive text of the illustration for the cover. This should include at a minimum the figure legend, article title, EES manuscript number and article authors' names. You must briefly (150 words or less) explain the contents of the figure in the email, its relevance to your article and the reason why you have chosen it. Convert the artwork and accompanying explanation to PDF format. For regular manuscripts send the PDF to Editor Tejraj Aminabhavi at aminabhavit@gmail.com, use "CEJ cover" as the subject line. If the manuscript belongs to a special issue, please send the PDF to the corresponding Guest Editor.

Selection of submitted figures is solely at the Editors' discretion. If your figure is selected, you will be contacted and advised if further information is needed. If your figure is selected for the cover, your article may be held slightly for publication for inclusion in the relevant issue. You will not receive correspondence if your figure is not selected.

Electronic artwork
General points
- Make sure you use uniform lettering and sizing of your original artwork.
- Embed the used fonts if the application provides that option.
• Aim to use the following fonts in your illustrations: Arial, Courier, Times New Roman, Symbol, or use fonts that look similar.
• Number the illustrations according to their sequence in the text.
• Use a logical naming convention for your artwork files.
• Provide captions to illustrations separately.
• Size the illustrations close to the desired dimensions of the published version.
• Submit each illustration as a separate file.
• Ensure that color images are accessible to all, including those with impaired color vision.

A detailed guide on electronic artwork is available. You are urged to visit this site; some excerpts from the detailed information are given here.

**Formats**
If your electronic artwork is created in a Microsoft Office application (Word, PowerPoint, Excel) then please supply 'as is' in the native document format. Regardless of the application used other than Microsoft Office, when your electronic artwork is finalized, please 'Save as' or convert the images to one of the following formats (note the resolution requirements for line drawings, halftones, and line/halftone combinations given below):
- EPS (or PDF): Vector drawings, embed all used fonts.
- TIFF (or JPEG): Color or grayscale photographs (halftones), keep to a minimum of 300 dpi.
- TIFF (or JPEG): Bitmapped (pure black & white pixels) line drawings, keep to a minimum of 1000 dpi.
- TIFF (or JPEG): Combinations bitmapped line/half-tone (color or grayscale), keep to a minimum of 500 dpi.

Please do not:
• Supply files that are optimized for screen use (e.g., GIF, BMP, PICT, WPG); these typically have a low number of pixels and limited set of colors;
• Supply files that are too low in resolution;
• Submit graphics that are disproportionately large for the content.

**Color illustrations**
If, together with your accepted article, you submit usable colour figures then Elsevier will ensure, at no additional charge, that these figures will appear in colour on the web (e.g., ScienceDirect and other sites) regardless of whether or not these illustrations are reproduced in colour in the printed version. Colour Illustrations can be printed in colour when they are judged by the Editor to be essential to the presentation. The publisher and the author will each bear part of the extra costs involved. For colour reproduction in print, you will receive information regarding the costs from Elsevier after receipt of your accepted article. For further information on the preparation of electronic artwork, please see https://www.elsevier.com/artworkinstructions.

Please note: Because of technical complications which can arise by converting colour figures to 'grey scale' (for the printed version should you not opt for colour in print) please submit in addition usable black and white prints corresponding to all the colour illustrations.

**Figure captions**
Ensure that each illustration has a caption. Supply captions separately, not attached to the figure. A caption should comprise a brief title (not on the figure itself) and a description of the illustration. Keep text in the illustrations themselves to a minimum but explain all symbols and abbreviations used.

**Tables**
Please submit tables as editable text and not as images. Tables can be placed either next to the relevant text in the article, or on separate page(s) at the end. Number tables consecutively in accordance with their appearance in the text and place any table notes below the table body. Be sparing in the use of tables and ensure that the data presented in them do not duplicate results described elsewhere in the article. Please avoid using vertical rules and shading in table cells.

**References**
Citation in text
Please ensure that every reference cited in the text is also present in the reference list (and vice versa). Any references cited in the abstract must be given in full. Unpublished results and personal communications are not recommended in the reference list, but may be mentioned in the text. If these references are included in the reference list they should follow the standard reference style of the
journal and should include a substitution of the publication date with either 'Unpublished results' or 'Personal communication'. Citation of a reference as 'in press' implies that the item has been accepted for publication.

Web references
As a minimum, the full URL should be given and the date when the reference was last accessed. Any further information, if known (DOI, author names, dates, reference to a source publication, etc.), should also be given. Web references can be listed separately (e.g., after the reference list) under a different heading if desired, or can be included in the reference list.

Data references
This journal encourages you to cite underlying or relevant datasets in your manuscript by citing them in your text and including a data reference in your Reference List. Data references should include the following elements: author name(s), dataset title, data repository, version (where available), year, and global persistent identifier. Add [dataset] immediately before the reference so we can properly identify it as a data reference. The [dataset] identifier will not appear in your published article.

References in a special issue
Please ensure that the words 'this issue' are added to any references in the list (and any citations in the text) to other articles in the same Special Issue.

Reference management software
Most Elsevier journals have their reference template available in many of the most popular reference management software products. These include all products that support Citation Style Language styles, such as Mendeley. Using citation plug-ins from these products, authors only need to select the appropriate journal template when preparing their article, after which citations and bibliographies will be automatically formatted in the journal's style. If no template is yet available for this journal, please follow the format of the sample references and citations as shown in this Guide. If you use reference management software, please ensure that you remove all field codes before submitting the electronic manuscript. More information on how to remove field codes from different reference management software.

Users of Mendeley Desktop can easily install the reference style for this journal by clicking the following link:
http://open.mendeley.com/use-citation-style/chemical-engineering-journal
When preparing your manuscript, you will then be able to select this style using the Mendeley plug-ins for Microsoft Word or LibreOffice.

Reference style
Text: Indicate references by number(s) in square brackets in line with the text. The actual authors can be referred to, but the reference number(s) must always be given.
Example: '..... as demonstrated [3,6]. Barnaby and Jones [8] obtained a different result ....'
List: Number the references (numbers in square brackets) in the list in the order in which they appear in the text.
Examples:
Reference to a journal publication:
Reference to a journal publication with an article number:
Reference to a book:
Reference to a chapter in an edited book:
Reference to a website:
Reference to a dataset:
Journal abbreviations source
Journal names should be abbreviated according to the List of Title Word Abbreviations.

Video
Elsevier accepts video material and animation sequences to support and enhance your scientific research. Authors who have video or animation files that they wish to submit with their article are strongly encouraged to include links to these within the body of the article. This can be done in the same way as a figure or table by referring to the video or animation content and noting in the body text where it should be placed. All submitted files should be properly labeled so that they directly relate to the video file's content. In order to ensure that your video or animation material is directly usable, please provide the file in one of our recommended file formats with a preferred maximum size of 150 MB per file, 1 GB in total. Video and animation files supplied will be published online in the electronic version of your article in Elsevier Web products, including ScienceDirect. Please supply 'stills' with your files: you can choose any frame from the video or animation or make a separate image. These will be used instead of standard icons and will personalize the link to your video data. For more detailed instructions please visit our video instruction pages. Note: since video and animation cannot be embedded in the print version of the journal, please provide text for both the electronic and the print version for the portions of the article that refer to this content.

Data visualization
Include interactive data visualizations in your publication and let your readers interact and engage more closely with your research. Follow the instructions here to find out about available data visualization options and how to include them with your article.

Supplementary material
Supplementary material such as applications, images and sound clips, can be published with your article to enhance it. Submitted supplementary items are published exactly as they are received (Excel or PowerPoint files will appear as such online). Please submit your material together with the article and supply a concise, descriptive caption for each supplementary file. If you wish to make changes to supplementary material during any stage of the process, please make sure to provide an updated file. Do not annotate any corrections on a previous version. Please switch off the 'Track Changes' option in Microsoft Office files as these will appear in the published version.

Research data
This journal encourages and enables you to share data that supports your research publication where appropriate, and enables you to interlink the data with your published articles. Research data refers to the results of observations or experimentation that validate research findings. To facilitate reproducibility and data reuse, this journal also encourages you to share your software, code, models, algorithms, protocols, methods and other useful materials related to the project.

Below are a number of ways in which you can associate data with your article or make a statement about the availability of your data when submitting your manuscript. If you are sharing data in one of these ways, you are encouraged to cite the data in your manuscript and reference list. Please refer to the "References" section for more information about data citation. For more information on depositing, sharing and using research data and other relevant research materials, visit the research data page.

Data linking
If you have made your research data available in a data repository, you can link your article directly to the dataset. Elsevier collaborates with a number of repositories to link articles on ScienceDirect with relevant repositories, giving readers access to underlying data that gives them a better understanding of the research described.

There are different ways to link your datasets to your article. When available, you can directly link your dataset to your article by providing the relevant information in the submission system. For more information, visit the database linking page.

For supported data repositories a repository banner will automatically appear next to your published article on ScienceDirect.

In addition, you can link to relevant data or entities through identifiers within the text of your manuscript, using the following format: Database: xxxx (e.g., TAIR: AT1G01020; CCDC: 734053; PDB: 1XFN).
**Mendeley Data**
This journal supports Mendeley Data, enabling you to deposit any research data (including raw and processed data, video, code, software, algorithms, protocols, and methods) associated with your manuscript in a free-to-use, open access repository. During the submission process, after uploading your manuscript, you will have the opportunity to upload your relevant datasets directly to Mendeley Data. The datasets will be listed and directly accessible to readers next to your published article online.

For more information, visit the Mendeley Data for journals page.

**Data in Brief**
You have the option of converting any or all parts of your supplementary or additional raw data into one or multiple data articles, a new kind of article that houses and describes your data. Data articles ensure that your data is actively reviewed, curated, formatted, indexed, given a DOI and publicly available to all upon publication. You are encouraged to submit your article for Data in Brief as an additional item directly alongside the revised version of your manuscript. If your research article is accepted, your data article will automatically be transferred over to Data in Brief where it will be editorially reviewed and published in the open access data journal, Data in Brief. Please note an open access fee of 600 USD is payable for publication in Data in Brief. Full details can be found on the Data in Brief website. Please use this template to write your Data in Brief.

**MethodsX**
You have the option of converting relevant protocols and methods into one or multiple MethodsX articles, a new kind of article that describes the details of customized research methods. Many researchers spend a significant amount of time on developing methods to fit their specific needs or setting, but often without getting credit for this part of their work. MethodsX, an open access journal, now publishes this information in order to make it searchable, peer reviewed, citable and reproducible. Authors are encouraged to submit their MethodsX article as an additional item directly alongside the revised version of their manuscript. If your research article is accepted, your methods article will automatically be transferred over to MethodsX where it will be editorially reviewed. Please note an open access fee is payable for publication in MethodsX. Full details can be found on the MethodsX website. Please use this template to prepare your MethodsX article.

**Data statement**
To foster transparency, we encourage you to state the availability of your data in your submission. This may be a requirement of your funding body or institution. If your data is unavailable to access or unsuitable to post, you will have the opportunity to indicate why during the submission process, for example by stating that the research data is confidential. The statement will appear with your published article on ScienceDirect. For more information, visit the Data Statement page.

**AFTER ACCEPTANCE**

**Online proof correction**
To ensure a fast publication process of the article, we kindly ask authors to provide us with their proof corrections within two days. Corresponding authors will receive an e-mail with a link to our online proofing system, allowing annotation and correction of proofs online. The environment is similar to MS Word: in addition to editing text, you can also comment on figures/tables and answer questions from the Copy Editor. Web-based proofing provides a faster and less error-prone process by allowing you to directly type your corrections, eliminating the potential introduction of errors. If preferred, you can still choose to annotate and upload your edits on the PDF version. All instructions for proofing will be given in the e-mail we send to authors, including alternative methods to the online version and PDF.

We will do everything possible to get your article published quickly and accurately. Please use this proof only for checking the typesetting, editing, completeness and correctness of the text, tables and figures. Significant changes to the article as accepted for publication will only be considered at this stage with permission from the Editor. It is important to ensure that all corrections are sent back to us in one communication. Please check carefully before replying, as inclusion of any subsequent corrections cannot be guaranteed. Proofreading is solely your responsibility.

**Offprints**
The corresponding author will, at no cost, receive a customized Share Link providing 50 days free access to the final published version of the article on ScienceDirect. The Share Link can be used for sharing the article via any communication channel, including email and social media. For an extra charge, paper offprints can be ordered via the offprint order form which is sent once the article is
accepted for publication. Both corresponding and co-authors may order offprints at any time via Elsevier's Author Services. Corresponding authors who have published their article gold open access do not receive a Share Link as their final published version of the article is available open access on ScienceDirect and can be shared through the article DOI link.

**AUTHOR INQUIRIES**
Visit the Elsevier Support Center to find the answers you need. Here you will find everything from Frequently Asked Questions to ways to get in touch. You can also check the status of your submitted article or find out when your accepted article will be published.

© Copyright 2018 Elsevier | https://www.elsevier.com