DESCRIPTION

*Materias and Design* publishes original research reports, review articles and express communications covering the studies of structure and properties of inorganic and organic materials, advances in synthesis, processing, characterisation and testing, design of materials and engineering systems, and applications in technology. The journal is multi-disciplinary in nature, and seeks to bring together aspects of materials science, engineering, physics, and chemistry. In exploring the themes ranging from materials to design, it also pursues the elucidation of underlying connections between natural and artificial, and experiment and modelling. Manuscripts submitted to *Materials and Design* are sought to contain elements of discovery and surprise that often accompany the obtention of new insights into the architecture and function of matter.

Authors who publish in *Materials and Design* will be able make their work immediately, permanently, and freely accessible. Materials and Design authors will pay an article publishing charge (APC), have a choice of license options, and retain copyright to their published work. The APC will be requested after peer review and acceptance and will be required for all accepted articles. The APC for *Materials and Design* is US $2,000 (excluding taxes).

For full information on publishing your paper open access in Materials and Design, visit the journal’s open access page and guide for authors, or visit our FAQs page. Click here to find out more about Materials Today’s Expanded Open Access options.

AUDIENCE

Engineering scientists and materials researchers, design engineers, consulting engineers, project managers and technical managers.

IMPACT FACTOR

2018: 5.770 © Clarivate Analytics Journal Citation Reports 2019
ABSTRACTING AND INDEXING

Science Citation Index Expanded
Web of Science
Materials Science Citation Index
Current Contents - Engineering, Technology & Applied Sciences
INSPEC - Physics Abstracts
Metals Abstracts
Cast Metals Journal
Research Alert
Scopus
Directory of Open Access Journals (DOAJ)

EDITORIAL BOARD

Editor-in-Chief
Alexander M. Korsunsky, University of Oxford Department of Engineering Science, Parks Road, Oxford, OX1 3PJ, United Kingdom

Editors
Geoff Gibson, Newcastle University, Newcastle Upon Tyne, United Kingdom
Eric Le Bourhis, Université de Poitiers, Institut P’, Futuroscope, France
Giang Nguyen, The University of Adelaide, Adelaide, Australia
Marco Sebastiani, Roma Tre University, Roma, Italy
Xu Song, Agency for Science Technology and Research, Singapore, Singapore

Assistant Managing Editors:
Muhammad Zeeshan Mughal, Roma Tre University, Roma, Italy
Wei Zhai, Singapore Institute of Manufacturing Technology, Singapore, Singapore

Journal Manager
Elavenhil Pallipatti Mohan, Elsevier, Chennai, United Kingdom

International Editorial Board
Esther Akinlabi, University of Johannesburg, Department of Mechanical Engineering Science, Johannesburg, South Africa
Moataz Attallah, University of Birmingham, Birmingham, United Kingdom
Filippo Berto, Norwegian University of Science and Technology, Trondheim, Norway
Ha Hong Bui, Monash University, Melbourne, Australia
Alain Celzard, Université de Lorraine, ENSTIB, Épinal Cedex 9, France
Daolun Chen, Ryerson University Department of Mechanical and Industrial Engineering, Toronto, Ontario, Canada
Igor Petrovich Dolbnya, Diamond Light Source, England United Kingdom
Ming Fu, The Hong Kong Polytechnic University, Dept. of Mechanical Engineering, Hong Kong, China
Lin Geng, Harbin Institute of Technology, Harbin, China
Sheng Guo, Chalmers University of Technology, Goteborg, Sweden
Stephen Hallett, University of Bristol, Bristol, United Kingdom
Louis Hennet, UPR3079 CNRS-CEMHTI, Conditions Extrêmes et Matériaux, 45071 ORLEANS CEDEX 2, France
Akiyo Hirose, Osaka University, Graduate School of Engineering, Osaka, Japan
Wei Min Huang, Nanyang Technological University, Singapore, Singapore
David Hui, University of New Orleans, New Orleans, Louisiana, United States
Surya Kalidindi, Georgia Institute of Technology, Atlanta, Georgia, United States
Josef Keckes, University of Leoben, Leoben, Austria
Andrei Kotousov, The University of Adelaide, Adelaide, Australia
Marin Lehockey, Tomas Bata University in Zlín, Zlín, Czech Republic
Yong-Cheng Lin, Central South University College of Mechanical and Electrical Engineering, Changsha, China
Elia Marin, Kyoto Institute of Technology, Kyoto, Japan
Johann Michler, Empa-Swiss Federal Laboratories for Materials Testing and Research, Dübendorf, Switzerland
Adrian Mouritz, RMIT School of Aerospace Mechanical and Manufacturing Engineering, Carlton, Australia
João Pedro Oliveira, New University of Lisbon, Lisboa, Portugal
Xuejun Ren, Liverpool John Moores University, Liverpool, United Kingdom
Fabrizio Scarpa, University of Bristol, Bristol, United Kingdom
Luming Shen, The University of Sydney, Sydney, Australia
Hugh Shercliff, University of Cambridge, Cambridge, United Kingdom
Hauke Springer, Max-Planck-Institut für Eisenforschung GmbH, Dusseldorf, Germany
Satyam Suwas, Indian Institute of Science, Bengaluru, India

Express Editor
Alexander Lunt, University of Bath, Department of Mechanical Engineering, Bath United Kingdom

Author Enquiries
For all author enquiries, please email jmad@elsevier.com.
GUIDE FOR AUTHORS

From January 2019 Materials & Design will become an open access journal. Authors who publish in Materials & Design will be able make their work immediately, permanently, and freely accessible. Materials & Design authors will pay an article publishing charge (APC), have a choice of license options, and retain copyright to their published work. The APC will be requested after peer review and acceptance and will be required for all accepted articles submitted after 1st November.

Your Paper Your Way
We now differentiate between the requirements for new and revised submissions. You may choose to submit your manuscript as a single Word or PDF file to be used in the refereeing process. Only when your paper is at the revision stage, will you be requested to put your paper in to a 'correct format' for acceptance and provide the items required for the publication of your article.

To find out more, please visit the Preparation section below.

Please note that Hardcopy submissions are no longer accepted.
The entire submission and review process for the Journal of Materials and Design is now handled electronically, which shortens publication times. All papers should be submitted electronically through the Elsevier Editorial System: http://ees.elsevier.com/jmad.
Prior to submitting your paper, please follow the instructions on manuscript preparation given below. Please note that you must have an e-mail address in order to use the online submission system. Authors submit their article online by simply registering, logging-in, and submitting. Detailed instructions on the use of the online submission system are available at http://ees.elsevier.com/jmad. Please read the "Hints" for information on how to register, and review the "Tutorial for Authors" for a run-through of the submission process. If you need any further help, please visit the Elsevier Support Center.

Types of contributions:

Authors submitting their work are encouraged to identify how their studies correspond to the priority areas of the journal, by indicating it in the Cover Letter and the text of their manuscript, referring to the Editorial Note.

Article submissions to Materials & Design fall into the following categories: Original Articles describe innovative research investigations, conducted in considerable depth, with critical analysis and discussion of the results, while drawing on relevant literature in the field, and seeking to establish connections between characterisation, modelling and experimental validation at the material and structural level.

Original articles may also be forwarded to the journal as contributions to Special Issues and Virtual Special Issues, to which the same criteria apply as for regular original articles.

The categories of technical note and short communication are no longer entertained.

Review articles must contain a critical assessment of methods, approaches, published results and their reliability, rather than simply a compendium of articles and summary of their contents. In other words, a review must not only provide a snapshot of state of the art in the field, but also contain authoritative judgements (firmly based on the authors track record of publishing on the topic) and contribute to the consolidation of knowledge in the relevant area.

Express Articles contain short communications of particularly timely, innovative and exciting developments in materials science, engineering and design, usually of experimental nature. They must be extremely concise (not exceeding 1000 words) and contain a single illustrative image (Graphical Abstract in the form of a single high quality, high resolution image in portrait orientation, 2000x1000 pixels) that tells the story in a clear and visually striking way.

Express articles can only be submitted upon the invitation by the Editor-in-Chief - if you have not had prior communication with the EiC on this subject, please contact him directly.
Research Data
This journal supports 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. When sharing data in one of these ways, you are expected 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 give 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. Before submitting your article, you can deposit the relevant datasets to Mendeley Data. Please include the DOI of the deposited dataset(s) in your main manuscript file. 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 statement
To foster transparency, authors are required to include a 'Data availability' section in their manuscript prior to their reference section. The intention of this section is to provide readers with information on where they can obtain the research data required to reproduce the work reported in the manuscript. This may also be a requirement of your funding body or institution. For more information on specific requirements, please visit the Materials Today Data Statement page.

Data in Brief
Authors have the option of converting any or all parts of their supplementary or additional raw or supporting data into one or multiple Data in Brief articles, a new kind of article that houses and describes their data. Data in Brief articles ensure that your data, which is normally buried in supplementary material, is actively reviewed, curated, formatted, indexed, given a DOI and publicly available to all upon publication. Authors are encouraged to submit their Data in Brief article as an additional item directly alongside the revised version of their manuscript. If your research article is accepted, your Data in Brief article will automatically be transferred over to Data in Brief where it will be editorially reviewed and published in the new, open access journal, Data in Brief. The Open Access fee for Data in Brief is $500.

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.

For technical support during the submission process, please visit the Elsevier Support Center.

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

For further information, visit our Support Center.

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 competing interests include employment, consultancies, stock ownership, honoraria, paid expert testimony, patent applications/registrations, and grants or other funding. Authors must disclose any interests in two places: 1. A summary declaration of interest statement in the title page file (if double-blind) or the manuscript file (if single-blind). If there are no interests to declare then please state this: 'Declarations of interest: none'. This summary statement will be ultimately published if the article is accepted. 2. Detailed disclosures as part of a separate Declaration of Interest form, which forms part of the journal's official records. It is important for potential interests to be declared in both places and that the information matches. 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').

**Author contributions**
For transparency, we encourage authors to submit an author statement file outlining their individual contributions to the paper using the relevant CRediT roles: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Resources; Software; Supervision; Validation; Visualization; Roles/Writing - original draft; Writing - review & editing. Authorship statements should be formatted with the names of authors first and CRediT role(s) following. More details and an example

**Article transfer service**
This journal is part of our Article Transfer Service. This means that if the Editor feels your article is more suitable in one of our other participating journals, then you may be asked to consider transferring the article to one of those. If you agree, your article will be transferred automatically on your behalf with no need to reformat. Please note that your article will be reviewed again by the new journal. More information.

**Copyright**
Upon acceptance of an article, authors will be asked to complete an 'Exclusive License Agreement' (see more information on this). Permitted third party reuse of 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.

**Funding body agreements and policies**
Elsevier has established a number of agreements with funding bodies which allow authors to comply with their funder's open access policies. Some funding bodies will reimburse the author for the gold open access publication fee. Details of existing agreements are available online.

From January 2019 Materials & Design will move from a subscription to a gold open access publishing model. Authors who publish in Materials & Design will make their work immediately, permanently, and freely accessible. Authors submitting to the journal on or after 1st November 2018 will be expected to cover the cost of the Article Publishing Charge (APC) to publish in the journal, will have a choice of license options and will retain copyright to their published work.
Creative Commons Attribution (CC BY)
Let others distribute and copy the article, create extracts, abstracts, and other revised versions, adaptations or derivative works of or from an article (such as a translation), include in a collective work (such as an anthology), text or data mine the article, even for commercial purposes, as long as they credit the author(s), do not represent the author as endorsing their adaptation of the article, and do not modify the article in such a way as to damage the author's honor or reputation.

Creative Commons Attribution-NonCommercial-NoDerivs (CC BY-NC-ND)
For non-commercial purposes, lets others distribute and copy the article, and to include in a collective work (such as an anthology), as long as they credit the author(s) and provided they do not alter or modify the article.

The gold open access publication fee for this journal is USD 2000 for Original articles and Review articles, USD 500 for Express articles, excluding taxes. Learn more about Elsevier's pricing policy: https://www.elsevier.com/openaccesspricing.

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 WebShop.

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, which is 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.

Editor's Requirements:
Review Process: All contributions are read by two or more referees to ensure both accuracy and relevance, and revisions to the script may thus be required. On acceptance, contributions are subject to editorial amendment to suit house style. When a manuscript is returned for revision prior to final acceptance, the revised version must be submitted as soon as possible after the author's receipt of the referees' reports. Revised manuscripts returned after four months will be considered as new submissions subject to full review.

PREPARATION
New Submissions
Submission to this journal proceeds totally online and you will be guided stepwise through the creation and uploading of your files. The system automatically converts your files to a single PDF file, which is used in the peer-review process. As part of the Your Paper Your Way service, you may choose to submit your manuscript as a single file to be used in the refereeing process. This can be a PDF file or a Word document, in any format or layout that can be used by referees to evaluate your manuscript. It should contain high enough quality figures for refereeing. If you prefer to do so, you may still provide all or some of the source files at the initial submission. Please note that individual figure files larger than 10 MB must be uploaded separately.

Note: Submissions that exceed 10Mb in size cannot be taken forward into consideration, since they are too unwieldy to download for the reviewers and editors. Authors are requested to reduce the size of images to ensure the submission size is acceptable. Authors will have a chance to provide high resolution images for publication if their manuscript is accepted.
References

References must reveal that the authors invested time and effort in embedding their study firmly in the current research context, both broad and spanning several research areas, and also more specific to the subject. References must be given in the correct journal style that must be checked thoroughly against the Instructions to Authors in force at the time. Submissions that fail to comply with this requirement may be rejected.

Building and maintaining thematic threads that connect certain themes is particularly important within a multi-disciplinary journal such as Materials & Design. For this reason the authors are encouraged to identify connections between their work and publications in the journal.

There are no strict requirements on reference formatting at submission. References can be in any style or format as long as the style is consistent. Where applicable, author(s) name(s), journal title/book title, chapter title/article title, year of publication, volume number/book chapter and the pagination must be present. Use of DOI is highly encouraged. The reference style used by the journal will be applied by Elsevier to the accepted article at the proof stage. Any missing data will be highlighted at proof stage for the author to correct.

Formatting requirements

There are no strict formatting requirements but all manuscripts must contain the essential elements needed to convey your manuscript, for example Abstract, Keywords, Introduction, Materials and Methods, Results, Conclusions, Artwork and Tables with Captions.

If your article includes any Videos and/or other Supplementary material, this should be included in your initial submission for peer review purposes.

Divide the article into clearly defined sections.

Figures and tables embedded in text

Please ensure the figures and the tables included in the single file are placed next to the relevant text in the manuscript, rather than at the bottom or the top of the file. The corresponding caption should be placed directly below the figure or table.

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.

Revised Submissions

The authors sent a "Revise" decision letter are given detailed instructions for revision that include an itemised list. The editorial instructions and review comments must be read attentively. The authors must make sure that they provide a separate document containing a detailed response to all comments. Failure to address some of the comments adequately may lead to submission being rejected. Ignoring comments is not a good strategy: the authors may consider some remarks insignificant or disagree with them, but they must engage with these remarks in some way in their revision. All changes made in the manuscript must be indicated in the revised submission using "yellow" background highlighting. The amount of time and effort spent by the editors and reviewers on assessing submissions and preparing reviews is considerable. The authors are asked to show appreciation for this work by paying close attention to all comments and instructions sent to them.

Use of word processing software

Regardless of the file format of the original submission, at revision you must provide us with an editable file of the entire article. Keep the layout of the text as simple as possible. Most formatting codes will be removed and replaced on processing the article. The electronic text should be prepared in a way very similar to that of conventional manuscripts (see also the Guide to Publishing with Elsevier). 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

Follow this order when typing manuscripts: Title, Authors, Affiliations, Abstract, Keywords, Main text (Introduction, Method, Results and Discussions), Acknowledgements, Appendix, References, Figure Captions and then Tables.
Collate acknowledgements in a separate section at the end of the article and do not include them on the title page, as a footnote to the title or otherwise. The body of the paper should not exceed 25 typed pages (including references and Figures) and must have clear structure corresponding to the accepted convention. The work reported must have clear novelty, and quantitative interpretation of the results must be provided.

**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.

**Abstract**

A concise and factual abstract is required. 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**

A Graphical abstract is mandatory for this journal. It should summarize the contents of the article in a concise, pictorial form designed to capture the attention of a wide readership online. Authors must provide images that clearly represent the work described in the article. Graphical abstracts should be submitted as a separate file in the online submission system.

A good Graphical Abstract conveys the story told by the paper in concise visual form that reveals the key aspect(s) of material structure or fabrication arrangements, design of experiment, process or system, the resulting (micro)structure, and the results of property testing. For example, the Graphical Abstract may illustrate that certain processing route leads to a particular arrangement of precipitates and grain morphology resulting in unusually high strength. In preparing the Graphical Abstract the authors should seek to capture all main findings of the study. Graphical Abstract must be a single image that is free of captions, accompanying text or explanation, although labels are obviously allowed to help identify microstructural features or read graph axes. Flow charts do not make good graphical abstracts, nor do typically single plots or micrographs. Graphical Abstract should not contain acronyms or abbreviations that may make it difficult to understand for the broad audience.

Image size: Graphical abstracts should be submitted as a separate file in the online submission system. The single digital image should have a minimum of 531 × 1328 pixels (h × w) or proportionally more. The image should be readable at a size of 5 × 13 cm using a regular screen resolution of 96 dpi. Preferred file types: TIFF, EPS, PDF or MS Office files. Authors can make use of Elsevier's Illustration and Enhancement service to ensure the best presentation of their images in accordance with the technical requirements See https://www.elsevier.com/graphicalabstracts for examples.

Authors can make use of Elsevier's Illustration and Enhancement service to ensure the best presentation of their images also in accordance with all technical requirements: Illustration Service.
**Highlights**

Highlights are mandatory for this journal. They consist of a short collection of bullet points that convey the core findings of the article and should be submitted in a separate editable file in the online submission system. Highlights should not contain acronyms or abbreviations that may make them difficult to understand for the broad audience.

Highlights play a particularly important role in Materials & Design. Whilst Abstract contains a concise statement of actions, materials used, methods employed, and results arrived at, Highlights must be firmly focused on novelty and originality, discovery and achievement. Highlights must be grammatically correct and complete sentences that encapsulate, in bullet point form, key new and unexpected findings reported in the manuscript.

Please use 'Highlights' in the file name and include 3 to 5 bullet points (maximum 20 words, per bullet point)

**Keywords**

Immediately after the abstract, provide a maximum of 6 keywords, avoiding general and plural terms and multiple concepts and do not use abbreviations. These keywords will be used for indexing purposes.

**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.

**Nomenclature and units**

Follow internationally accepted rules and conventions: use the international system of units (SI). If other quantities are mentioned, give their equivalent in SI. You are urged to consult IUPAC: Nomenclature of Organic Chemistry for further information.

**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 build footnotes into the text, and this feature may be used. Should this not be the case, indicate the position of footnotes in the text and present the footnotes themselves separately at the end of the article.

**Artwork**

*Electronic artwork*

**General points**

- Make sure you use uniform lettering and sizing of your original artwork.
- Preferred fonts: Arial (or Helvetica), Times New Roman (or Times), Symbol, Courier.
- Number the illustrations according to their sequence in the text.
- Use a logical naming convention for your artwork files.
- Indicate per figure if it is a single, 1.5 or 2-column fitting image.
• For Word submissions only, you may still provide figures and their captions, and tables within a single file at the revision stage.
• Please note that individual figure files larger than 10 MB must be provided in separate source files. 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
Regardless of the application used, 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 the font or save the text as 'graphics'.
TIFF (or JPG): Color or grayscale photographs (halftones): always use a minimum of 300 dpi.
TIFF (or JPG): Bitmapped line drawings: use a minimum of 1000 dpi.
TIFF (or JPG): Combinations bitmapped line/half-tone (color or grayscale): a minimum of 500 dpi is required.

Please do not:
• Supply files that are optimized for screen use (e.g., GIF, BMP, PICT, WPG); the resolution is too low.
• Supply files that are too low in resolution.
• Submit graphics that are disproportionately large for the content.

Color artwork
Please make sure that artwork files are in an acceptable format (TIFF (or JPEG), EPS (or PDF), or MS Office files) and with the correct resolution. If, together with your accepted article, you submit usable color figures then Elsevier will ensure, at no additional charge, that these figures will appear in color online (e.g., ScienceDirect and other sites) regardless of whether or not these illustrations are reproduced in color in the printed version. For color reproduction in print, you will receive information regarding the costs from Elsevier after receipt of your accepted article. Please indicate your preference for color: in print or online only. Further information on the preparation of electronic artwork.

Figure captions
Ensure that each illustration has a caption. 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.

Reference links
Increased discoverability of research and high quality peer review are ensured by online links to the sources cited. In order to allow us to create links to abstracting and indexing services, such as Scopus, CrossRef and PubMed, please ensure that data provided in the references are correct. Please note that incorrect surnames, journal/book titles, publication year and pagination may prevent link creation. When copying references, please be careful as they may already contain errors. Use of the DOI is highly encouraged.
A DOI is guaranteed never to change, so you can use it as a permanent link to any electronic article. An example of a citation using DOI for an article not yet in an issue is: VanDecar J.C., Russo R.M., James D.E., Ambeh W.B., Franke M. (2003). Aseismic continuation of the Lesser Antilles slab beneath northeastern Venezuela. Journal of Geophysical Research, https://doi.org/10.1029/2001JB000884. Please note the format of such citations should be in the same style as all other references in the paper.

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.

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/materials-and-design

When preparing your manuscript, you will then be able to select this style using the Mendeley plug-ins for Microsoft Word or LibreOffice.

Reference formatting

There are no strict requirements on reference formatting at submission. References can be in any style or format as long as the style is consistent. Where applicable, author(s) name(s), journal title/book title, chapter title/article title, year of publication, volume number/book chapter and the article number or pagination must be present. Use of DOI is highly encouraged. The reference style used by the journal will be applied to the accepted article by Elsevier at the proof stage. Note that missing data will be highlighted at proof stage for the author to correct. If you do wish to format the references yourself they should be arranged according to the following examples:

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:
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.

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.

AFTER ACCEPTANCE
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 (in a templated letter that will be supplied on request from the Journal Manager) 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.

Online proof correction
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 Webshop. 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.