

Style and formatting guide

Manuscripts should be formatted as below at the point of acceptance. Manuscripts do not need to be formatted at submission or during revision.

The title should summarize the key findings in a single statement of 15 words or fewer

[Acronyms, element symbols and compound formulae should be avoided in the title where possible]

[Firstname I. Surname¹, Firstname I. Surname^{1,2*}](#)

¹ Full postal address of first affiliation.

² Full postal address of second affiliation.

[Job titles must not be included in the affiliations or author list. Affiliations must be numbered in the order of their first appearance in the author list. Each affiliation must contain only one address. Where relevant, 'present address' must be provided as the final affiliation.]

At least one corresponding author must be designated. An e-mail address must be provided for each corresponding author, and only one e-mail address is permitted per corresponding author. For each corresponding author, and for any author who wishes for their ORCID to be included in the final article, [an ORCID should be included in their author profile](#) in our manuscript tracking system prior to formal acceptance. ORCIDs should not be included in the author list.

Author tagging statements are limited to the following two options: "These authors contributed equally" and "These authors jointly supervised this work", with no more than one of each tag permitted.]

Abstract (mandatory)

- Must begin with the heading 'Abstract'.
- Should be 150 words or fewer.
- Should be accessible to non-specialists.
- Should include the background and context of the work, then 'Here we show' or an equivalent phrase, and then the major results and conclusions of the paper in the present tense.
- Hyperbolic language (e.g. novel, unprecedented, remarkable, etc.) should be avoided.
- Acronyms should be avoided wherever possible.
- Names of elements should be written out in full (compound formulae are however permitted).
- Must not contain references.
- Any key species, protein names, and gene names should be mentioned in the title and/or abstract to ensure optimal retrieval of the paper in database searches.
- Graphical abstracts are not supported and should not be supplied.

Introduction (mandatory)

- Must begin with the heading 'Introduction'.
- Should include the background and rationale for the work.
- The final paragraph should be a brief summary of the major results and conclusions.

Language and style, applicable throughout manuscript

- Language such as "new", "novel", "for the first time", "unprecedented", etc, should be avoided because it often leads to unproductive controversy. Novelty should be clear from the context.
- Text must not be copied directly from published work (even your own) without clear attribution, including one or more references.
- Acronyms should be defined upon first use. No list or table of abbreviations/definitions is permitted. Non-standard two letter abbreviations should be avoided. Acronyms and abbreviations should be used only if they appear three or more times in the text.
- Use of speech marks around words or phrases should be avoided; if a phrase is non-standard, please explain the meaning instead; otherwise they are usually unnecessary.
- We do not allow use of bold or italics to convey emphasis.
- The names of biological species must be italicized.
- Only official gene/protein names should be used. Genes and RNA should be italicized. Proteins should not.
- Bold font should be used for numbering chemical compounds. Chemical abbreviations or formulae should not be bolded.
- Mathematical terms should conform to the following guidelines:

- > Scalar variables (e.g. x , V , χ) should be typeset in italics.
- > Multi-letter variables should be formatted in Roman.
- > Constants (e.g. \hbar , G , c) should be typeset in italics (the only exceptions being e , i , π , which should be typeset in Roman) and vectors (such as r , the wavevector k , or the magnetic field vector B) should be typeset in bold without italics.
- > In contrast, subscripts and superscripts should only be italicised if they too are variables or constants. Those that are labels (such as the 'c' in the critical temperature, T_c , the 'F' in the Fermi energy, E_F , or the 'crit' in the critical current, I_{crit}) should be typeset in Roman.
- > To avoid doubt, unit dimensions should be expressed using negative integers (e.g. $\text{kg m}^{-1} \text{s}^{-2}$, not kg/ms^2) or the word 'per'.

Results (mandatory) or Results and Discussion

- Must begin with the heading 'Results', or 'Results and Discussion' if the two are fully integrated.
- Where it would benefit readability, we recommend splitting the Results/Results and Discussion section into subheaded sections. No more than two levels of subheadings are permitted.
- If personal communication from anyone outside of the author list is cited, written permission must be provided.
- All data that support the conclusions drawn must be presented in the manuscript unless they are published elsewhere. We do not allow statements of "data not shown".
- We recommend a maximum of 5 display items (figures and tables) for ~2500 words and 10 display items for ~5000 words.
- Schemes are not permitted and must be labelled as Figures instead.
- Chemical reactions must be labelled as Equations if displayed as text, or as Figures if displayed as images.
- Figures must be provided as separate files at a minimum resolution of 300 dpi at final size. Figures appear at 9 or 18 cm width (1 or 2 columns respectively).
- Figures must be in file type .psd, .ai, .eps, .tiff, .jpg, .pdf, .ps, .gif, .ppt, .pptx, .png, .bmp, .vsd, .cdx, .svg or .emf. We recommend using [vectographic formats](#) as these lead to higher resolution figures.
- Figures must be supplied whole, with all panels included in a single file.
- We strongly discourage the use or adaptation of previously published images (including figures from the literature, stock photos, clip art or commercial satellite and map data), but if this is unavoidable, you must request the necessary rights documentation to re-use such material from the relevant copyright holders and submit this to us alongside your manuscript. An appropriate permissions statement must be present in the relative figure caption for any third-party images.
- If individuals are identifiable in images, their written permission is required.
- When choosing a colour scheme please consider how it will display in black and white (if printed), and to users with colour blindness. Please consider distinguishing data series using line patterns rather than colours, or using optimised colour palettes such as those found at doi 10.1038/nmeth.1618.

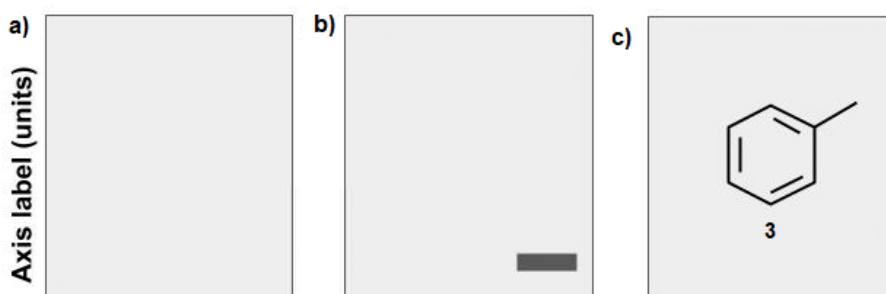


Figure 1. Figure captions must start with a brief title that describes the Figure as a whole and does not contain reference to specific figure panels. Figure captions must also have a legend that defines each Figure panel individually. Readers should be able to understand the Figure without reference to the main text. Figure panels must be labelled with lower case letters rather than referring to portions of the Figure as 'top' 'bottom' 'left', etc. All figure panels must be defined in the legend. Abbreviations, symbols, colours and shading must be defined. **a)** Where error bars are used, they must be defined. Axis and panel labels will be published as received; we recommend using a sans-serif font such as Arial or Helvetica, **b)** microscopy images and photographs must be accompanied by scale bars, which must be defined, **c)** chemical structures that appear in Figures in the manuscript should be drawn using the Nature Chemistry template (available at: http://www.nature.com/authors/guides/NR_chemdraw_stylesheets.cds) or using the setting from this template – structures should, however, be scaled in proportion to fit our Figure dimensions, without changing the bond thickness. Compound numbering should be in bold font and consistent with numbering through the main text.

- All Figures must be cited in the text in numerical order. Multiple Figures can be cited as e.g. "Figures 1-3".
- Tables must be provided in word-editable format (Word/TeX/Excel/csv).
- Tables must have a caption. Abbreviations and symbols/variables listed in Tables must be defined in a caption.
- Data in Tables must be free from bold/italic formatting unless this has been clearly defined in the footnote.
- Tables must only contain black and white text, with no colours or shading.
- Where Tables contain images, each image should appear in its own cell in the absence of any text.
- All Tables must be cited in the text in numerical order.
- Equations must be supplied in an editable format, and not as images.
- Where numbered equations are provided, they must appear in sequential order.
- Supplementary items must be cited in a consistent format throughout the manuscript, and in line with the labels used in the Supplementary Information. We recommend using the following formats: Supplementary Figure 1, Supplementary Table 1, Supplementary Methods, Supplementary Note 1, Supplementary Discussion, Supplementary References, Supplementary Movie 1, Supplementary Audio 1, Supplementary Data 1 and Supplementary Software 1.
- All Supplementary items should be cited in the main manuscript. General citations to the Supplementary Information (e.g. "see Supplementary Information") should be avoided.

Discussion (optional)

- The discussion should consist of an extended analysis of the results and their comparison to the literature rather than a short summary or conclusion.

Methods (mandatory, unless purely theoretical work)

- The Methods and Supplementary Methods must together include sufficient detail such that the work could be reproduced. The methods section should not contain excessive use of phrases such as "as described previously".
- It is preferable that all key methods be included in the main manuscript, rather than in the Supplementary Information.
- Where it would benefit readability, we recommend splitting the methods section into subheaded sections. No more than two layers of subheadings are permitted.
- Please refer to our guidelines for our requirements for the [characterization of chemical and biomolecular materials](#).
- When electronic structure calculations are reported in the manuscript, the atomic coordinates of the optimized computational models should be provided. For molecular dynamics trajectories, at least the initial and final configurations should be supplied. We encourage you to make them available by uploading the structures in any of the [existing data repositories](#). Alternatively, they can be supplied as a separate Supplementary Data file (ideally as a plain, unformatted text file).
- Please refer to our reporting summaries for [claims of lasing](#) or [solar cell](#) results.
- Please refer to our [reporting summary](#) for life science manuscripts.
- Where animal testing is performed, a statement affirming that you have complied with all relevant ethical regulations for animal testing and research is necessary. A statement explicitly confirming if the study received ethical approval, including the name of the board and institution that approved the study protocol is also required.
- Details of geological samples and palaeontological specimens that include clear provenance information are needed. Information regarding the requisite permission obtained is required. Palaeontological and type specimens should be deposited in a recognised museum or collection.

Data availability (mandatory)

- For a list of example data availability statements, please see <http://www.nature.com/authors/policies/data/data-availability-statements-data-citations.pdf>
- *For Communications Earth and Environment*. At the time of publication, the minimal dataset necessary to interpret, replicate and build upon the methods or findings reported in the article should be placed in a publically available repository. If this is not possible, for example, for legal or ethical concerns, this must be clearly stated in the Data Availability statement.
- Small molecule crystallographic data must be deposited with the CCDC or the ICSD. Please provide the relevant accession codes in this section, e.g. "The X-ray crystallographic coordinates for structures reported in this study have been deposited at the Cambridge Crystallographic Data Centre (CCDC), under deposition numbers XXXXXXXX-YYYYYYYY. These data can be obtained free of charge from The Cambridge Crystallographic Data Centre via www.ccdc.cam.ac.uk/data_request/cif." Please also supply cifs as Supplementary Data files.
- For novel protein structures, a stereo image of a portion of the electron density map (including contour level and type of map) must be provided for crystallographic structures, or the superimposed lowest energy structures (>10) for NMR structures. Structural data must be deposited in the relevant publicly accessible database, and accession codes must be provided in the data availability section.

- Authors should cite any datasets stored in external repositories that are mentioned within their manuscript. For previously published datasets, we ask authors to cite both the related research articles and the datasets themselves. For more information on how to cite datasets in submitted manuscripts, please see our submission guidelines.
- Extended data items are not permitted and must be placed in the Supplementary Information instead.

Code availability (mandatory for articles with new custom code)

- For all studies developing new software or using custom code that is deemed central to the conclusions, a statement must be included indicating whether and how the code can be accessed, including any restrictions to access. This section should also include information on the versions of any software used, if relevant, and any specific variables or parameters used to generate, test, or process the current dataset.
- Please see our policy on code availability for more information. <http://www.nature.com/sdata/for-authors/editorial-and-publishing-policies#code-avail>

References (mandatory)

1. References must be listed by number and should be given in the order of appearance in the text, then tables, figures and finally boxes
2. Each reference must contain only one item; compound references are not permitted.
3. Manuscript citations must include journal title; article title; volume number; start and end page or article number or DOI; and year of publication.
4. No publication can be present more than once in the reference list.
5. No footnotes are permitted in the references or elsewhere. Text must instead be incorporated into the main text, the Methods section, or the Supplementary Information.
6. Any in-text citations to references (e.g. "Gupta et al. show...") should be followed by their corresponding reference citation number from the reference list.
7. Where possible, preprints in the reference list should be updated with details of the published, peer-reviewed paper.
8. Only articles that have been published or accepted by a named publication or recognised preprint server can be listed in the References. Other persistent and recognised sources such as books and monographs are also permitted. Websites should only be cited if they are in common use or curated.
9. For LaTeX files, the bibliography must be either provided separately or contained within the .tex file.

Acknowledgements (optional)

- Acknowledgements must be relevant, appropriate and kept to a minimum.
- No separate funding section is permitted. Funding information should be included in the Acknowledgements.

Author contributions (mandatory)

- An author contributions statement that individually lists the specific contributions of each author to the work must be provided.
- All authors must be referred to by name or initials in this statement.
- All authors must be clearly disambiguated from one another.

Competing interests (mandatory)

- If no competing interests exist, the statement 'the authors declare no competing interests' should be given.
- All authors must be accounted for within the statement, e.g. with use of 'all other authors declare no competing interesting' where relevant.
- For patents, full details including patent name, number, authors, and geographical region should be provided.

Supplementary information

- The Supplementary Information must be provided as a single separate file in PDF format. Supplementary Figures must not be provided separately and should instead be provided within the PDF.
- We do not edit Supplementary Information files; they will be uploaded with the published article as they are submitted with the final version of your manuscript. Any tracked changes should be removed from the file.

- Any information provided on the cover/title page of the Supplementary Information must match the title and author list in the main manuscript.
- We recommend labelling and citing Supplementary items using the following formats: Supplementary Figure 1, Supplementary Table 1, Supplementary Methods, Supplementary Note 1, Supplementary Discussion, and Supplementary References.
- All Supplementary text must be included under a citeable section heading, and all sections must be cited in the main manuscript file. We recommend including text under a Supplementary Methods, Supplementary Note, or Supplementary Discussion heading.
- All Supplementary items should be cited in the main manuscript, and can be cited in blocks, e.g. “for NMR spectra see Supplementary Figures xx-yy”
- Each Supplementary Figure requires a caption. These should be presented below the Figure and should refer to all panels.
- Error bars in Supplementary Figures must be defined.
- Mathematical terms or formulae should be formatted correctly in the Supplementary Information (see language & style subsection above).
- Where data are presented in Supplementary Information, large datasets must be supplied as Supplementary Data files, whereas smaller Tables must be supplied as Supplementary Tables.
- Supplementary References should appear at the end of the Supplementary Information file, and should be self-contained and numbered from 1. References mentioned in both the main text and the Supplementary Information must be part of both reference lists so that the Supplementary Information does not refer to the reference list in the main paper and vice versa.
- Where Supplementary Movie/Audio/Data/Software files are provided, each file should be labelled as Supplementary Movie/Audio/Data/Software 1, etc., and legends for these should be given in the cover letter (not in the Supplementary Information file).
- All Supplementary Movie/Audio/Data/Software must be cited in the main manuscript.
- Supplementary Software must be supplied as a ZIP file
- We recommend limiting the size of each Supplementary file to 50MB.