



HOW TO WRITE AN EFFECTIVE RESEARCH PAPER

- Getting ready with data
- First draft
- Structure of a scientific paper
- Selecting a journal
- Submission
- Revision and galley proof

Disclaimer: The suggestions and remarks in this presentation are based on personal research experience. Research practices and approaches vary. Exercise your own judgment regarding the suitability of the content.

–P. Kamat



Getting ready with data

Gather all important data, analyses, plots and tables

Organize results so that they follow a logical sequence (this may or may not be in the order of experiments conducted)

Consolidate data plots and create figures for the manuscript
*(Limit the number of total figures (6-8 is usually a good number).
Include additional data, multimedia in the Supporting Information.)*

Discuss the data with your advisor and note down important points

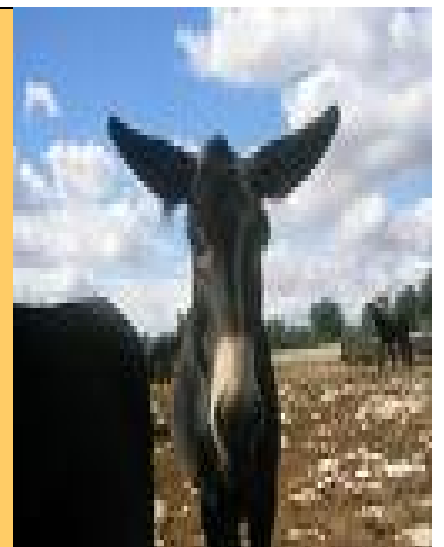
Important: **KNOW** the focus of your paper

It takes a wise man to know whether he
has found a **ROPE** or **LOST A MULE**.

- Anonymous quote



?





First draft

Identify **two or three important findings** emerging from the experiments. Make them the central theme of the article.

Note good and bad writing styles in the literature. Some are simple and easy to follow, some are just too complex.

Note the readership of the journal that you are considering to publish your work

Prepare figures, schemes and tables in a professional manner
(Pay attention to quantification of data accuracy, significant digits, error bars,)

0.001 1×10^{-3} -- one sig fig

0.00100 1.00×10^{-3} -- three sig figs



Structure of a scientific paper

Title

Abstract

TOC Graphics

Introduction

Experimental Section

(Some papers require this section to be at the end)

Results and Discussion

Conclusions

Acknowledgments

References

Supporting Information

Title

Compose a title that is simple, attractive and accurately reflects the investigation

- *Phrases to avoid: Investigation, Study, Novel, Facile etc.*
- *Avoid Acronyms that are known only to specialized community*

Study of SERS Chemical Enhancement Factors Using Buffer Layer Assisted Growth of Metal Nanoparticles on Self-Assembled Monolayers

Masato M. Maitani[†], Douglas A. A. Ohlberg[§], Zhiyong Li[§], David L. Allara^{†‡}, Duncan R. Stewart[§] and R. Stanley Williams[§]

Publication Date (Web): April 16, 2009 (Communication)

DOI: 10.1021/ja809347y

Which of these two titles make you read the paper?

“Signal-On” Detection of DNA Hole Transfer at the Single Molecule Level

Tadao Takada, Yuichiro Takeda, Mamoru Fujitsuka and Tetsuro Majima^{*}

Publication Date (Web): April 23, 2009 (Communication)

DOI: 10.1021/ja9009919

Also try to get it right

How Graphene Is Cut upon Oxidation?

Zhenyu Li^{†‡}, Wenhua Zhang^{†‡}, Yi Luo^{†‡}, Jinlong Yang[†] and Jian Guo Hou[†]

Publication Date (Web): April 17, 2009 (Communication)

DOI: 10.1021/ja8094729



Abstract

First couple of sentences should focus on what the study is about. Include major findings in a style that a general readership can read and understand (*i.e., avoid detailed experimental procedures and data.*) Keep it short and effective.

-Be creative in generating curiosity

Large Aggregated Ions Found in Some Protic Ionic Liquids

Danielle F. Kennedy and Calum J. Drummond
J. Phys. Chem. B, **2009**, **113** (17), pp 5690–5693

Large aggregated parent ions, for example, $C_8A_{7\pm}$ (C = cation and A = anion), have been observed within some protic ionic liquids (PILs) using electrospray ionization mass spectrometry (ESI-MS). We have shown that the formation and size of aggregates is dependent on the nature of the anion and cation. Solvent structuring in select PILs through aggregation can contribute to their classification as “poor ionic liquids” and can also strongly influence the entropic component to the free energy of amphiphile self-assembly in select PILs.

Keep it simple and informative

TOC Graphics

A scheme or figure to convey the theme of paper

N Doping of Oxide Nanosheets

Yasumichi Matsumoto*, Michio Koinuma*, Yoshifumi Iwanaga, Tetsuya Sato and Shintaro Ida

Publication Date (Web): April 24, 2009 (Communication)

DOI: 10.1021/ja807388t

[Abstract](#) | [Supporting Info](#)

- [Full Text HTML](#)
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- [Subscriber Access](#)

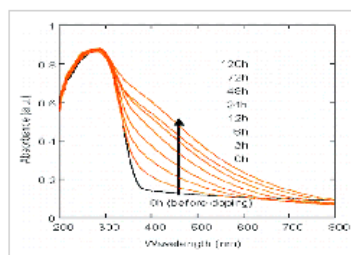


Figure 1 of 3

[Next](#)

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Make use of TOC Graphics to convey the theme

Highly Efficient and Rapid Cs⁺ Uptake by the Layered Metal Sulfide

$K_{2x}Mn_xSn_{3-x}S_6$ (KMS-1)

Manolis J. Manos and Mercuri G. Kanatzidis*

Publication Date (Web): April 17, 2009 (Article)

DOI: 10.1021/ja900977p

[Abstract](#) | [Supporting Info](#)

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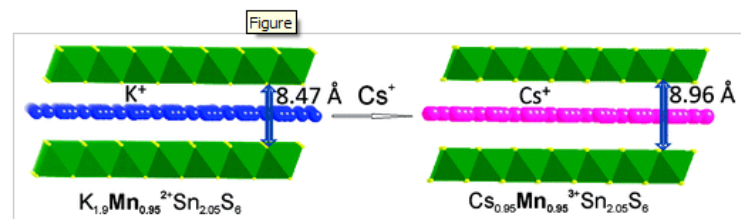


Figure 1 of 10

[Next](#)

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Graph

versus

Scheme



Structure of a scientific paper

Introduction

- Start the section with a general background of the topic.
- Add 2-3 paragraphs that discuss previous work.
- Point out issues that are being addressed in the present work.

Experimental Section

- Divide this section into Materials & Methods, Characterization, Measurements and Data analysis

Results and Discussion

- (These two sections can be combined or separate)
- Describe the results in detail and include a healthy, detailed discussion
 - The order of figures should follow the discussion themes and not the sequence they were conducted
 - Discuss how your data compare or contrast with previous results.
 - Include schemes, photographs to enhance the scope of discussion

Avoid

- Excessive presentation of data/results without any discussion
- Citing every argument with a published work



Structure of a scientific paper

Conclusions

Include major findings followed by brief discussion on future perspectives and/or application of present work to other disciplines.

Important: Do not rewrite the abstract.

Statements with “Investigated” or “Studied” are not conclusions!

Acknowledgments

Remember to thank the funding agency and
Colleagues/scientists/technicians who might have provided assistance

References

The styles vary for different journals. (Use ENDNOTE, RefWorks)

Some journals require complete titles of the cited references

Please check for the accuracy of all citations

Supporting Information

Include methods, analysis, blank experiments, additional data



Selecting a journal

Each journal specializes in a specific area of research. Hence its readership varies. A proper choice of journal can make a larger impact of your research.

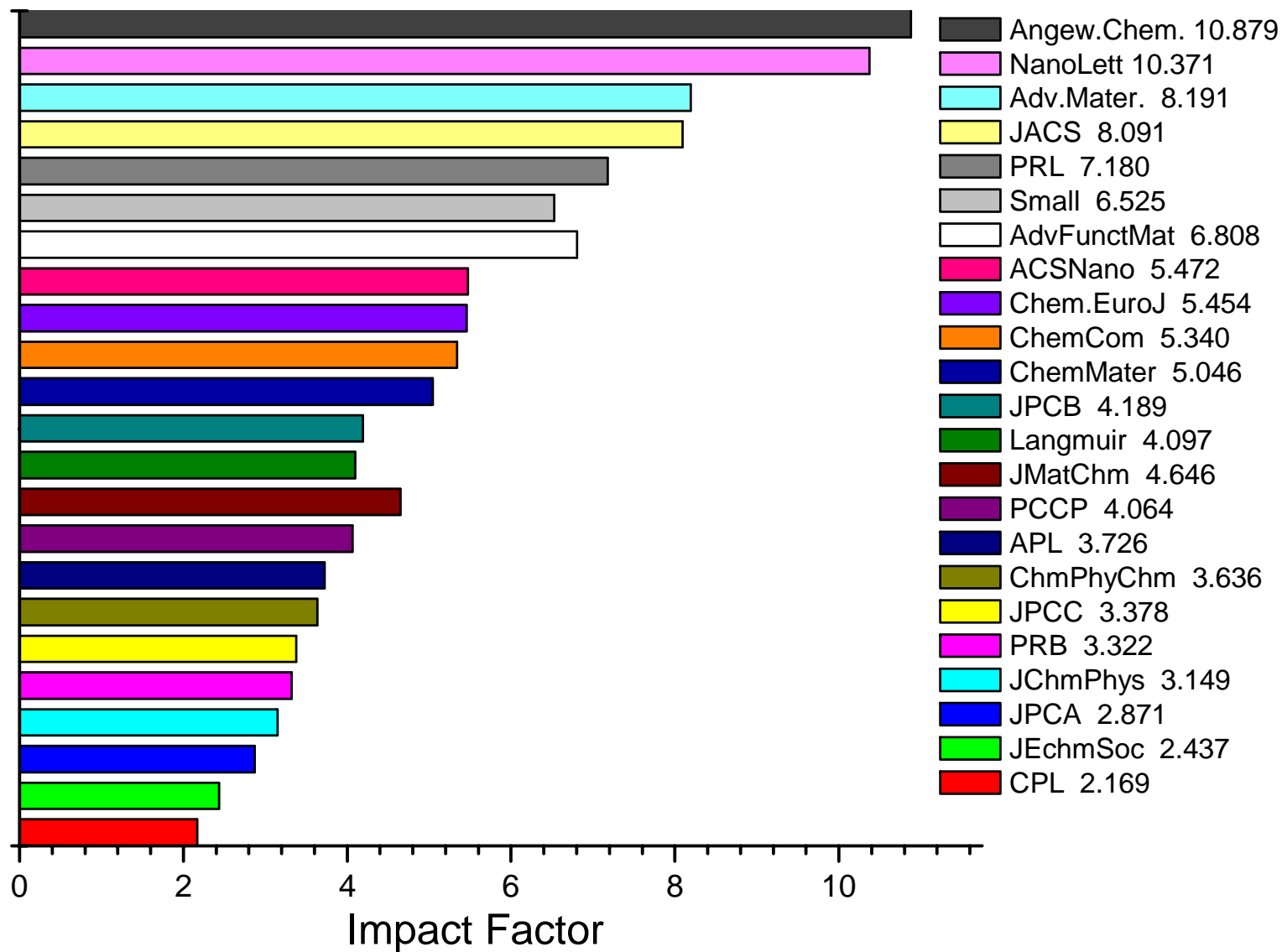
Get to know the focus and readership of the journal that you are considering. - general vs. specialized area journal

Select 2 or 3 journals in the chosen area with relatively high impact factors. Discuss with your advisor and decide on the journal

Find out the journal's submission criteria and format

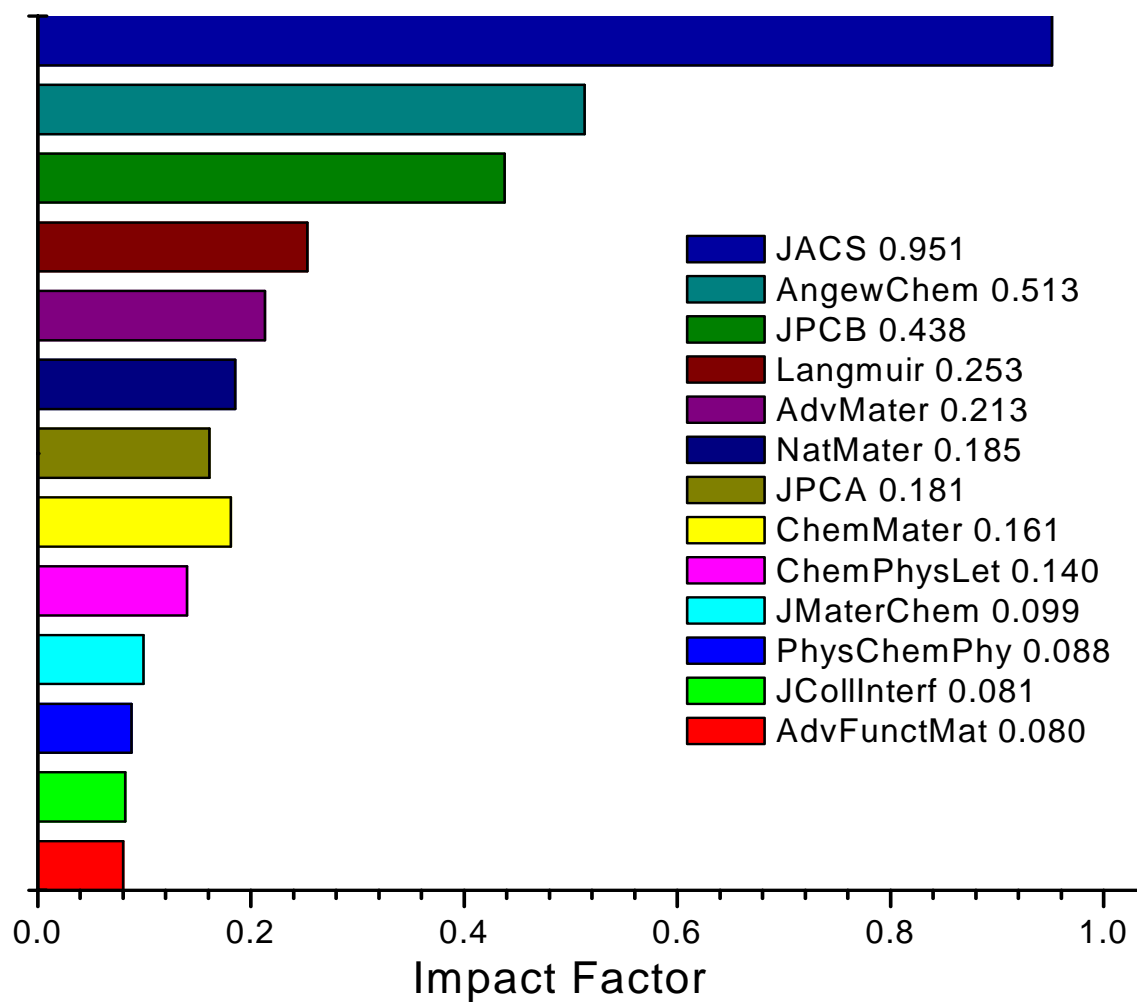
Tip: Does your references cite journals in the appropriate area?

2008 IMPACT FACTORS OF POPULAR JOURNALS



$$IF(2008) = \frac{\text{No. of 2006\&2007 citations in 2008}}{\text{No of papers published in 2006\&2007}}$$

2008 EIGENFACTORS OF TOP 11 PHYS CHEM JOURNALS (PLUS JACS AND ANGEW CHEM)



Eigenfactor Score:

- Impact factor based on citations of past 5 years.
- Eliminates self-citations.
- Weighs each reference according to a stochastic measure



Submission

Read the finalized paper carefully. Check for accuracy of figures and captions. Are the figures correctly referred to in the text?

Get feedback from advisor and colleagues.

Make sure the paper is read by at least one or two colleagues who is not familiar with the specific work.

Provide a cover letter to the editor along with a brief paragraph highlighting the importance of this work and names of possible reviewers.

Have all coauthors approve the finalized version of the paper

Submit the paper online along with copyright form.



Revision and galley proof

- The manuscript is usually reviewed by 2-3 reviewers
- Reviewers point out deficiencies and/or suggestions to improve the scientific content
- Read their comments carefully. (If reviewer misunderstands a point, the point probably needs revision or additional support.)
 - Do not blame the reviewer for his/her misunderstanding!
- Be polite and respectful when disagreeing a reviewer's comment
- Include a point-by-point explanation of changes made in the text in response to reviewers' comments
- Once again, carefully read the paper for its accuracy in presenting the data
- Submit the revised version
- Once accepted for publication you should receive the galley proof within a month. This is one last chance to make any final corrections.



What to do if a paper gets rejected.....

Do not get discouraged. Read editorial comments and discuss with advisor/students/collaborators. Find out how you can make this study stronger and acceptable for publication.

Do not just turn around and submit the paper to another journal. Read carefully the comments and find ways to improve the scientific quality of the papers

Carry out additional experiments and improve the quality of scientific discussions. (Journals often look for papers with quantitative and mechanistic information that represent new physical insights)

Rejected papers can be resubmitted if and only the concerns of the reviewers are adequately addressed and new results are included.

If you have questions, please feel free to contact the editorial office.



What to Avoid?

- Data without scientific discussion, applications of data, or reviews of the literature are not sufficient.
- Routine synthesis and characterization of nanomaterials or studies that report incremental advance are not considered suitable for publication.
- Use of the phrase “**Novel**” or “**First-time**” in the title or abstract. Such descriptions do not impress the reader or the reviewer.
(Other over used phrases “**One-pot synthesis**”, “**Facile**”)
- Names of flowers, fruits and vegetables to describe the nanoparticle/nanostructure shapes/morphology



To do even better

The authors should make every effort to make a good presentation with proper usage of English grammar.

Ask a colleague to comment on your paper before sending it for publication.

“**English is not my Native Language**” is not a valid justification for reviewer who cannot comprehend.

Reviewers do not wish to review papers that are not readable. Badly written papers are often recommended as “**REJECT**” by the Reviewers

ACS Publication office helps to edit the language for accepted manuscripts, but this only happens if the English was good enough to be reviewed.



Ten characteristics of an incredibly dull paper

Sand-Jenson in Oikos 2007, 116 723 (C&E News Sept 10, 2007)

1. Avoid Focus
2. Avoid originality and personality
3. Make the article really really long
4. Do not indicate any potential implications
5. Leave out illustrations (...too much effort to draw a sensible drawing)
6. Omit necessary steps of reasoning
7. Use abbreviations and technical terms that only specialists in the field can understand
8. Make it sound too serious with no significant discussion
9. Focus only on statistics
10. Support every statement with a reference



For more research tips

See <http://www.nd.edu/~pkamat>

Good Luck!



Do not ever give up!