



Writing and Publishing Scientific Papers In English:

Strategies and Tips from a
Native English Speaker

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Outline

- Reasons to write a paper
- Strategy for writing your paper
 - How to conceive and organize your paper?
 - How to go about the writing?
 - How to avoiding copying?
- Typical grammar and style mistakes of Chinese writers of English
 - Many examples...
 - Student participation!



Important: Read the Literature!

- Being VERY familiar with the literature is a key to doing good research AND writing excellent papers
 - What has been done? **don't repeat it!**
 - What things are still not known? – **make an impact!**
 - Those that publish in your area will review your paper – **you better know about their work!**
- The more reading you do, the more you learn how to construct and write papers in English!
 - You learn the way people write, how they express things, how not to express things, etc.
- Complete literature search/review of your field **BEFORE** you start writing any paper!
 - Multiple electronic databases, followed by reading each paper and finding papers within those



Why Write a Paper?

- Because I need to publish a paper to graduate!
- Because my advisor told me I have to!
- Because I want to publish in Science or Nature!
-
- **Because you have done some good research and you have an interesting and impactful story to tell!**



Determining the Story

- What is the main finding/conclusion?
 - For a Note or Communication, maybe only one
 - For a full Research Article, maybe 2-3 of them
- What data/results/calculations will support your findings/conclusions
 - Lay out the Figures and Tables in support of your story
 - Not all data you have collected is relevant!
 - Just because you spent a lot of effort collecting some data does not mean it will go in your paper.
 - Decide if you need to collect more data/results to support the conclusion
 - Are your conclusions adequately supported?
 - Think about if you were an impartial reviewer, would you believe your story?



Writing the Story - Overview

- The story usually is not written in the same order as it is presented!
- Order of the manuscript
 - Abstract, Introduction, Experimental, Results, Discussion, Conclusions
- Order of writing
 - Experimental, Results, Discussion, Conclusions, Introduction, Abstract



Writing the Story - Strategy

- Step 0: Make an Outline!
- Step 1: Construct all Figures, Tables, Schemes
 - this will give you a framework for your writing
- Step 2: Write the Experimental Section
 - materials, procedures, techniques
- Step 3: Write the Results/Discussion
 - use the figures/tables to guide you, making sure that they always serve the story you are telling
 - write the results first (i.e. the results ‘story’), then fill in the discussion sentences, comparing to the literature
 - make sure that each discussion leads into the next results section



Writing the Story - Strategy

- **Step 4: Write the Conclusions**
 - formulate new aspects that come out as a result of the work and future directions.
 - not a list of what you have done...the reader already got that from the Results/Discussion!
- **Step 5: Write the Introduction**
 - go from general to specific background (usually 3-5 paragraphs for an article, 1-2 paragraphs for a note)
 - everything should lead to the final paragraph where you briefly indicate what the paper is focused on
- **Step 6: Write the Abstract**
 - summarizes the key findings/conclusions that someone will get from reading the paper



Avoiding Copying/Plagiarism

- Copying parts of other papers
 - not ethical behavior!
 - actually will hurt the logical flow of your paper
- Journals are getting very technologically advanced to detect copying
- The key to avoiding copying is to write short summaries of various papers you will reference.
 - Don't worry about the English...take notes, in both English and Chinese if you wish
 - Then when you write, you reference the notes, not the original paper



Strategies for Writing

- **First Draft:**
 - Use a conversational flow within the paper structure, using third person as much as possible
 - Tell the story naturally, connecting things together in a logical fashion – one thing leads to another
 - Don't focus on trying to make the English/grammar perfect or using elegant words or phrases
- **Second Draft:**
 - Go through first draft, focusing on logic, grammar and format.
 - Now you can use some favorite papers and English Grammar web sites to help guide you in these corrections
 - E.g., <https://owl.english.purdue.edu/owl/section/1/5/>
- **NEVER** turn in a first draft to your advisor!
 - At least three edits by you...
 - Consider starting a writing club, where one of your fellow students can read your paper draft and give you suggestions



General English Writing Tips

- **Place most important subject/clause at the front of the sentence**
 - makes the primary idea more clear
- **Limit or avoid placing prepositional phrases or adverbs at the beginning of sentences**
 - e.g., indicating time or comparison
 - exception is when following on from from a previous sentence
- **Don't always give the purpose, condition, location or reason for the main idea, especially if already stated earlier.**
- **Avoid long sentences by limiting sentences to 1-2 primary ideas**
 - probably 20 words is a good upper bound
- **Use third person narrative as much as possible**
 - more objective and comfortable for reader to accept your results and conclusions as opposed to always writing “we”



Actual Writing Sample #1

Old

Although these methods are very useful in preparing cobalt silicide samples, they have some shortcomings such as high cost of devices and high consumptions of energy and time because of the large energy barrier for the diffusion of solids, which restricted their applications in catalysis.



Actual Writing Sample #2

Old

The supported carbon membranes were synthesized by one-step coating on the support modified by the OMC interlayer and achieved O_2 , CO_2 and H_2 permeances of 74.5, 88.0 and 545.5 $\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}\cdot\text{Pa}^{-1}\times 10^{-10}$, respectively, which are about 4 times higher than those without interlayer and demonstrates great competition respect to other carbon membranes reported in literature.



Common English Grammatical Errors of Native Chinese Speakers

- Verb Tenses
- Compound Nouns
- Frequent Repetition of Information
- Articles
- Subject-Verb Agreement
- Prepositions
- Connecting Words/Phrases
- Comprehensive Negative Qualities
- Respectively



Verb Tenses

- Present Tense
 - Use for established facts, i.e., “things everyone agrees with”
 - Use for referencing Tables, Schemes, or Figures
 - Use to describe what your results mean now and in future
- Examples:
 - “Gold nanoparticles **have** a variety of interesting applications.”
 - “Table 1 **lists** the various sizes of the Au nanoparticles.”
 - “These results **indicate** that the size of Au nanoparticles **depends** directly on the synthesis method.”



Verb Tenses

- Past Tense
 - Use for non-general findings – i.e., a specific result of a previous researcher
 - Use to describe your results – i.e., what you have done
- Examples:
 - “Williams et al. **showed** that Au could be used for hydrogenation of CO₂”
 - “It was **found** from the TEM data analysis that the nanoparticle size **increased** as the synthesis temperature **was raised**.”



Compound Noun Phrases

- Use compound noun phrases to make things smoother

Replacing “hydrogenation of benzene at high temperature in the liquid phase” with “high-temperature liquid-phase benzene hydrogenation” maybe be a bit too much!

- Don't overdue it!
- But use adjectives when possible, e.g.,
 - “conditions of the environment” becomes “environmental conditions”
 - “method of spectroscopy” becomes “spectroscopic method”



Verb Tense and Compound Noun Usage

- Figure 1 showed the typical surface infrared spectrum that we obtained from the synthesized nanomaterial. Several peaks are observed in the C=O and C-C stretching regions of the spectrum. These peaks are assigned to the functional group of the organic, and its presence suggests that that the desired modification of the surface is successful. This result was similar to that of Williams et al., who find that this modification method is very effective.



Verb Tense and Compound Noun Usage

- Figure 1 **showed** the typical surface infrared spectrum **that we** obtained from the synthesized nanomaterial. Several peaks **are** observed in the C=O and C-C stretching regions of the spectrum. These peaks are assigned to **the functional group of the organic**, and **its** presence suggests that that the desired **modification of the surface is** successful. This result **was** similar to that of Williams et al., who **find** that this modification method **is** very effective.



Verb Tense and Compound Noun Usage

- Figure 1 **shows** the typical surface infrared spectrum **that was** obtained from the synthesized nanomaterial. Several peaks **were** observed in the C=O and C-C stretching regions of the spectrum. These peaks are assigned to the **organic functional group**, and **their** presence suggests that that the desired **surface modification was** successful. This result **is** similar to that of Williams et al., who **found** that this modification method **was** very effective.



Avoid Frequent Repetition of Information

- If paper (or paper section) is about one thing (or group of things) it is not necessary to indicate repeatedly
- Example (section about a heterogeneous Pt catalyst)
 - The **heterogeneous Pt catalyst** was characterized by TEM and the particle size was found to be 10 nm. Based on these results, the catalytic activity and selectivity of the **heterogeneous Pt catalyst** were tested.
 - The **catalyst** was characterized by TEM and the particle size was found to be 10 nm. Based on these results, **its** catalytic activity and selectivity were tested.



Articles

- Definite Article: “the”
 - used for a particular/specific object or situation (or particular/specific objects or situations)
- Indefinite Article: “a” or “an”
 - used for one of many possible objects or situations
 - BUT not used with ‘indefinite’ nouns
- One of the most common errors made by Chinese English writers!
 - omitted where they are required
 - used when not needed or contribute to wordiness
 - used wrongly in place of the correct article.



Articles (examples)

- The journal needs a statement certifying that all the authors have been consulted and agree with the paper as submitted.
- Copper is an essential element for a variety of technological applications.
- The catalyst was much improved when the promoter was added.
- A catalyst can be much improved when a promoter is added.



Articles (lets consider this again...)

- Example 1:
 - The journal needs a statement certifying that all the authors have been consulted and agree with the paper as submitted.
 - The journal needs a statement certifying that all authors have been consulted and agree with the paper as submitted.
- Example 2:
 - Copper is an essential element for a variety of technological applications.
 - Copper is one of the essential elements for a variety of technological applications.
- All examples above are correct! There is often more than one correct way to express the same meaning! Can be confusing!



Articles (more examples with errors)

- Example 1:
 - The software GAUSSIAN was chosen to be **a** tool for DFT modeling due to its excellent robustness.
 - The software GAUSSIAN was chosen to be **the** tool for DFT modeling due to its excellent robustness.
- Example 2:
 - Ordered mesoporous precursor synthesized by soft-templating approach has successfully been used to prepare carbon interlayer between thin separation layer and support of carbon membranes.
 - **An** ordered mesoporous precursor synthesized by **the** soft-templating approach has successfully been used to prepare **a** carbon interlayer between **the** thin separation layer and **the** support of carbon membranes.
- Example 3:
 - After modified by OMC, the surface of support was completely covered with OMC interlayer (Fig. 8c,d), and became smoother and free of defects.
 - After **being** modified, the surface of **the** support was completely covered with **an** OMC interlayer (Fig. 8c,d), and became smoother and defect free.
 - The surface of **the** support was completely covered with **an** OMC interlayer after modification (Fig. 8c,d), and became smoother and defect free.



Actual Writing Sample #3

Old

In addition, the amount of strong acid sites of the sample modified using NaOH are almost the same to the unmodified sample, while the strength of strong acid sites slightly decrease, which is related to the Na^+ ions being exchanged into cationic sites of the zeolites during the NaOH treatment (Na^+ contents are 0.33 wt% measured by ICP) [18].



Actual Writing Sample #4

Old

All the NiSi_x samples show certain coercivity (H_c) at room temperature, which is characteristic for the ferromagnetic behavior of nanoparticles. Besides this variety of coercivity is attributed to that the modifying by silicon atoms and the formation of the NiSi_x phases. Their saturation magnetization values at 4000 Oe drastically decrease after an amount of Si adding into Ni.



Actual Writing Sample #5

Old

With the extend of aging time, the unreacted -OH groups of metal atom (Cr) which are responsible for the formation of Cr-O-Cr bonds by liberating H₂O in the condensation reaction which will further condense to well-developed network structure, resulting in more stabilized gel which less pore collapse during drying. Therefore, the surface areas initially increased.



Subject-Verb Agreement

- Must determine which nouns/subjects and verbs go together in a sentence
- Make sure that singular and plural usage is correct
- Present tense: e.g. Increase, Increases
 - pressure increases, pressures increase
 - it increases, they increase
- Present tense: Has, Have
 - it has, they have
 - catalyst has, catalysts have



Subject-Verb Agreement

- Present tense: Do, Does
 - it does, they do
- Present/past tense: Be (is,are,was,were)
 - it is/was, they are/were
 - measurement is/was, measurements are/were
 - “am” is never used in a paper since it goes with “I”



Subject-Verb Agreement

- Gold nanoparticle size **is** one of the important physical properties that **affect** surface-enhanced Raman activity.
- The journal **needs** a statement certifying that all authors **have** been consulted and **agree** with the paper as submitted.
- The high metal loading of the catalysts used in many industrial applications **is** responsible for their elevated cost.



Prepositions

- The correct use of prepositions (e.g., *in*, *at*, *on*, *to*, *into*) is often difficult for non-native English speakers to master.
- This part-of-speech is especially problematic for Chinese speakers
- No strong distinction between different prepositions in the Chinese language.



Prepositions (cont.)

- The key to using prepositions and prepositional phrases is to be clear about what the desired meaning is
 - direction, place, time, cause, manner/method/condition, amount
- *about, above, across, after, against, along, among, around, as, at, before, behind, below, beneath, beside, between, beyond, by, down, during, except, for, from, in, inside, into, like, near, of, off, on, onto, out, outside, over, past, regarding, since, through, throughout, till, toward, under, until, up, upon, with, within, and without.*



Connecting Words and Phrases

- Do not start paragraphs (or sentences) with: “And”, “But”, “Meanwhile”, “As for”, “Besides” etc.
- Use “But”, “However”, “Although”, “In contrast”, etc. to foreshadow a change or difference in emphasis.
- Use “Therefore”, “Thus”, “Hence”, “Further”, “Furthermore”, etc. to foreshadow agreement or continuation of the same theme.
- Don't overuse connecting words!



Connecting Words and Phrases (Examples)

Examples:

“Smith (2002) showed..., **but** Jones (2003) found [something else]”

“Smith (2002) showed...; **however**, Jones (2003) reported [something else]”; or:

‘Smith showed..... **However**, Jones ...’ - *depends on sentence length.*

‘**Although** Smith (2002) showed..., Jones (2003) demonstrated [something else]’

‘Phosphate uptake by wheat was decreased when As was present. **In contrast**, P uptake by barley was not lowered by As.’



Connecting Words and Phrases (Examples)

- After several sentences describing a Pt catalyst...
 - “Lastly, it was found that the spent catalyst contained a significant amount of carbon impurity on its surface. It is **therefore** [or “**thus**”] likely that this was the cause for the decreased activity that was observed.” Or – “**Hence, it is likely that...**”
 - “The catalyst was found to contain Pt nanoparticle sizes within the range of 2-4 nm. **Furthermore**, the shape of these particles was found to be spherical. **In contrast**, Pt particles in catalysts prepared by a different method showed larger particles (5-8 nm) with irregular shapes.”
- Avoid over-use of “then”.
 - Do not say: “The catalysts were synthesized using wet impregnation. **Then** they were filtered, **then** weighed and **then** dried”
 - “After catalysts were synthesized using wet impregnation, they were filtered, dried and weighed.”



Comprehensive Negative Qualities

- Comprehensive negative qualities are expressed differently.
 - Chinese: "這些學生都沒書"
"All of the students don't have books"
 - English: "None of the students have books"



Comprehensive Negative Qualities

- Comprehensive negative qualities are expressed differently.
 - Chinese: "All of these catalysts don't have small particle sizes"
 - English: "None of these catalysts have small particle sizes"
- Logically, these statements are identical, but each language prefers different form



Respectively

- “Respectively” is used to link the order of one list of things to another list of things
- The nanoparticle was synthesized using gold chloride and sodium borohydride, respectively
- Correct: The nanoparticle was synthesized using gold chloride and sodium borohydride as the metal salt and reducing agent, respectively.
- A conversion of 60% and a selectivity of 90% were found for the catalyst, respectively.
- Correct: The conversion and selectivity of the catalyst were 60% and 90%, respectively
- The Raman spectra showed peaks at 450 and 2050 cm^{-1} , respectively, from CO.
- Correct: The Raman spectra showed peaks at 450 and 2050 cm^{-1} , respectively, for the Pt-C and C-O stretching vibrations.



Actual Writing Sample #6

Old

The diffraction peaks belonged to FeSi_2 became stronger and the peaks belonged to Fe almost vanished except for the very weak Fe [110] signal, suggesting that the Si atoms decomposed from SiH_4 deposited on the Fe surface and then diffused into the crystal lattice of iron atom forming FeSi_2 . Interestingly, the peaks of Fe_2O_3 and SiO_2 cannot be found in the samples been silification when exposed to the air, indicating that the SiO_2 may be amorphous and exist on the surface as a shell to protect the metallic Fe and FeSi_2 from oxidizing.



Actual Writing Sample #7

Old

The high surface area Cu-Cr xerogels have successfully been prepared by an epoxide assisted route under the optimized conditions like gelation temperature, the amount of water in solvent, and the gel aging time. The obtained Cu-Cr catalysts with Cr_2O_3 and CuCr_2O_4 phases have high activity than that with Cu and Cr_2O_3 phases for glycerol conversion, which is tentatively attributed to the metal-support interactions between metallic Cu and CuCr_2O_4 or Cr_2O_3 .



Actual Writing Sample #8

(from an Introduction)

Old

Unfortunately, the conversion of the hydrogenation of 2-butyne-1,4-diol (BYD) was significantly decreased and the catalysts were easier deactivated due to the aggregation of particles of Pd. The poisons also need to complete removal in order to obtain the highest purity of the product for fine chemical and pharmaceutical applications. Supported Ni catalysts and Raney Ni catalyst could also hydrogenate BYD to BED or BDO but is not satisfactory due to their low activity and selectivity, and deactivation.