

how to write a literature review chemistry

how to write a literature review chemistry effectively is a crucial skill for any aspiring or established researcher in the chemical sciences. This comprehensive guide will illuminate the intricate process, from defining your research scope to meticulously synthesizing information from diverse chemical literature. We will delve into strategies for efficient source retrieval, critical analysis, and the structured presentation of findings that underpin a robust literature review in chemistry. Understanding the nuances of scientific writing, maintaining objectivity, and adhering to established citation practices are paramount for demonstrating a thorough grasp of the existing knowledge base. By following the detailed steps outlined, you will gain the confidence and expertise necessary to produce a high-quality literature review that not only summarizes current research but also identifies gaps and establishes the context for your own scientific contributions. This article aims to be an authoritative resource, offering practical advice and best practices for navigating the complexities of chemical literature. Mastering this skill is fundamental for academic success and professional development within the field.

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Understanding the Chemistry Literature Review

A literature review in chemistry is far more than a simple summary of existing papers; it is a critical synthesis of scholarly publications on a specific topic, demonstrating your understanding of the current state of research. Its purpose is to contextualize your own work, identify gaps in knowledge, and highlight significant advancements within the chemical field. This foundational piece of academic writing establishes credibility and showcases your ability to navigate the vast landscape of scientific information, making it an indispensable component of theses, dissertations, and grant proposals in chemistry.

The process of writing a literature review for chemistry demands a deep engagement with the scientific discourse. It requires an analytical mindset to evaluate experimental designs, interpret data, and assess the significance of findings. Unlike a simple annotated bibliography, a literature review integrates various sources into a cohesive narrative, identifying common themes, contradictory evidence, and emerging trends. It sets the stage for new research by clearly delineating what is known, what is debated, and what remains unexplored, thereby providing a robust intellectual framework for your own contributions.

What is a Literature Review in Chemistry?

In the realm of chemistry, a literature review is a structured and critical account of published information and sources on a specific research topic. It involves more than just listing articles; it requires you to synthesize, analyze, and critically evaluate the current body of knowledge, pointing out strengths, weaknesses, and potential areas for future exploration. This analytical summary helps readers understand the existing research landscape, the theoretical underpinnings, and the methodologies employed by other researchers in the chemical sciences.

Essentially, a literature review in chemistry provides a comprehensive overview of the academic progress related to a particular chemical phenomenon, reaction, or application. It often traces the historical development of an idea, discusses prevailing theories, examines experimental approaches, and summarizes key findings. The goal is to build a coherent argument that justifies the need for your own research by demonstrating how it fits into, extends, or challenges the existing scientific discourse.

It's a testament to your understanding of the chemical literature.

Why is a Chemistry Literature Review Important?

The importance of a chemistry literature review cannot be overstated, as it serves multiple critical functions for both the writer and the scientific community. Primarily, it establishes the context and significance of your research question, demonstrating that you are well-versed in the current scholarly discussions and that your work is not merely a replication of previous efforts. This foundational understanding is vital for constructing a compelling research proposal or thesis.

Furthermore, writing a literature review in chemistry helps to refine your own research methodology. By examining how others have approached similar problems, you can identify effective experimental designs, analytical techniques, and potential pitfalls to avoid. It also aids in identifying existing gaps or controversies in the chemical literature that your research can address, thus justifying the novelty and importance of your contribution. For researchers, it's a critical tool for learning, for supervisors, it assesses your knowledge, and for readers, it offers a quick pathway into the core ideas of a specific chemical field.

Pre-Writing Essentials: Laying the Foundation for Your Chemistry Literature Review

Before embarking on the actual writing, a substantial amount of preparatory work is required to ensure your chemistry literature review is thorough and well-organized. This preparatory phase is critical for establishing a solid foundation, allowing for a more efficient and effective writing process. It involves clearly defining your research scope, systematically searching for relevant chemical literature, and implementing robust methods for managing the vast array of scientific sources you will encounter. Neglecting these initial steps can lead to disorganization, missed crucial papers, and an incoherent review.

The success of how to write a literature review chemistry often hinges on the meticulousness of this pre-writing stage. It's an iterative process where initial searches might refine your research question,

and new insights might lead to further exploration. Taking the time to properly plan and organize your resources will not only save time in the long run but also significantly enhance the quality and depth of your final submission, ensuring it accurately reflects the current state of knowledge in your specific area of chemistry.

Defining Your Research Question or Scope

The first and most crucial step in preparing to write a literature review in chemistry is to precisely define your research question or the scope of your review. A well-defined question acts as a compass, guiding your search for relevant chemical literature and helping you stay focused amidst the enormous volume of available information. Without a clear scope, you risk becoming overwhelmed by too many irrelevant articles or producing a review that lacks cohesion.

Consider what specific aspect of chemistry you are interested in exploring. Is it a particular reaction mechanism, the synthesis of a novel compound, an analytical technique, or the application of a chemical principle? Your question should be specific enough to be manageable, yet broad enough to allow for a comprehensive exploration of the existing research. For instance, instead of "chemistry of polymers," a more focused question might be "Recent advances in conductive polymer synthesis for organic photovoltaic applications." This precision ensures that your literature search is targeted and your review is relevant.

Effective Strategies for Searching Chemical Literature

Once your research question is defined, the next critical step is to employ effective strategies for searching the chemical literature. This involves identifying the most appropriate databases, utilizing specific keywords, and understanding how to filter and refine your search results to pinpoint highly relevant scholarly articles and reviews. A systematic approach to searching is key to ensuring you don't miss important foundational or cutting-edge research.

Key resources for chemistry literature include:

- **Chemical Abstracts Service (CAS) SciFinder**[®]: Indispensable for comprehensive chemical

information, including structures, reactions, and patents.

- **Web of Science/Scopus:** Broad multidisciplinary databases for peer-reviewed articles, offering citation tracking to find influential papers and their successors.
- **PubMed (for chemical biology/biochemistry):** Focuses on biomedical literature, useful for interdisciplinary chemistry topics.
- **Google Scholar:** A good starting point for identifying key authors and seminal papers, but results may be less curated.
- **Publisher Websites (e.g., ACS Publications, RSC Publishing):** Direct access to journals, often with advanced search features.

Utilize a combination of keywords derived from your research question, including synonyms and related terms. Employ Boolean operators (AND, OR, NOT) to refine your searches. Don't forget to use citation tracking (forward and backward) to discover related works and identify highly cited papers that have shaped the field. Regularly reviewing the reference lists of highly relevant articles you find will uncover additional valuable sources, making your literature search more robust.

Managing and Organizing Your Chemistry Research Sources

As you gather an increasing number of sources, efficient management and organization become paramount for a successful chemistry literature review. Without a robust system, you risk losing track of important papers, duplicating efforts, or struggling to locate specific information when you begin writing. Effective source management tools and practices are essential for keeping your research organized and accessible.

Consider using reference management software such as Zotero, Mendeley, or EndNote. These tools allow you to:

1. Store citations and PDFs in one centralized location.
2. Automatically generate bibliographies in various citation styles (e.g., ACS, APA).
3. Annotate PDFs and add personal notes to articles.
4. Organize sources into folders based on themes, subtopics, or relevance.

Beyond software, developing a consistent naming convention for your downloaded PDFs and creating an outline or matrix to track key findings, methodologies, and conclusions from each paper can be incredibly helpful. This proactive approach to organization will streamline the synthesis process when you transition from research to writing, making the task of how to write a literature review chemistry significantly more manageable.

Structuring Your Chemistry Literature Review Effectively

The structure of your chemistry literature review is just as important as its content. A well-organized review guides the reader through the existing research logically, highlighting key developments and insights without confusion. A haphazard structure can undermine even the most thoroughly researched content, making it difficult for the reader to grasp your main arguments or understand the trajectory of the field. Therefore, careful consideration of how you arrange your information is fundamental to a high-quality review.

An effective structure typically involves a clear introduction, body paragraphs organized thematically or chronologically, and a concluding section that synthesizes the findings and points towards future directions. Each section should flow seamlessly into the next, building a cohesive narrative that demonstrates your critical understanding of the chemical literature. This systematic approach ensures clarity, coherence, and impact, solidifying your argument as you learn how to write a literature review chemistry that is both informative and persuasive.

Crafting a Compelling Introduction for Your Chemistry Review

The introduction of your chemistry literature review is the gateway to your work; it must immediately capture the reader's attention and clearly outline the scope and purpose of your review. A strong introduction sets the stage, providing necessary background information while articulating the central themes and the overarching argument you intend to make. It should succinctly inform the reader what the review is about and why it is important within the broader context of chemistry.

Within your introduction, you should:

- Briefly introduce the general topic of your review.
- Provide background information to contextualize the research area.
- State the specific focus or research question your review addresses.
- Explain the scope of your review (e.g., time period, types of studies included).
- Outline the organizational structure of the review (e.g., "This review will first discuss... then explore... and finally conclude with...").
- Clearly state the significance of your review, highlighting any gaps it aims to fill or new perspectives it offers.

This initial section is crucial for setting expectations and engaging your audience, demonstrating from the outset your command of the chemical literature and your ability to frame a compelling academic discussion.

Developing Logical Thematic Sections in Chemistry

After a strong introduction, the body of your chemistry literature review should be organized into logical

thematic sections. This is where you delve into the details of the existing research, presenting and analyzing various studies that pertain to your topic. Organizing by theme, rather than simply listing studies chronologically, allows for a more analytical and integrative discussion, highlighting connections and contrasts between different pieces of research.

Each thematic section should focus on a distinct aspect or sub-topic of your main research question. For example, if reviewing synthesis of a specific material, themes might include "Traditional Synthetic Routes," "Catalytic Enhancements," "Mechanistic Studies," or "Emerging Green Chemistry Approaches." Within each theme, synthesize findings from multiple sources, discussing how different studies contribute to the understanding of that particular aspect. Avoid merely summarizing each article individually; instead, group them by their contributions to a specific idea or debate. This approach demonstrates a deeper critical analysis and helps readers track the development of ideas within the chemical literature.

Writing a Cohesive Discussion and Conclusion for Chemistry Literature

The discussion and conclusion section of your chemistry literature review is where you bring all the analyzed information together, synthesizing the findings and offering your overall interpretation of the current state of research. This is not merely a summary of what you've already said, but a crucial opportunity to reflect on the implications of the reviewed literature and to articulate your unique perspective on the topic. It serves as the culmination of your efforts to understand how to write a literature review chemistry that is both insightful and impactful.

In this final section, you should:

- **Summarize Main Findings:** Briefly reiterate the most significant findings and trends identified across the literature.
- **Evaluate the Literature:** Discuss the strengths and weaknesses of the existing research, highlighting any inconsistencies, controversies, or gaps in the chemical literature.
- **Synthesize Implications:** Explain what the collected research collectively suggests about your

topic. How do the various studies fit together?

- **Relate to Your Research:** If this review is part of a larger project (e.g., a thesis), clearly explain how the literature review provides a foundation for your own proposed research, demonstrating its necessity and novelty.
- **Propose Future Directions:** Based on the identified gaps and limitations, suggest specific areas for future research within chemistry.
- **Concluding Statement:** End with a strong, concise statement that reinforces the importance of the topic and the contributions of your review.

This section solidifies your authority on the subject and provides a compelling rationale for further investigation, leaving the reader with a clear understanding of the broader context and the path forward in the chemical sciences.

Mastering the Writing Process for Chemistry Literature

Reviews

Mastering the writing process for chemistry literature reviews involves more than just compiling facts; it requires a sophisticated blend of analytical skill, clear communication, and adherence to scientific conventions. It's about transforming raw data and diverse findings into a coherent, compelling narrative that informs and persuades. This stage demands precision in language, objectivity in presentation, and meticulous attention to detail in referencing, all crucial elements of how to write a literature review chemistry that meets academic standards.

Effective scientific writing in a literature review means presenting complex chemical concepts and experimental results in an accessible yet rigorous manner. It also involves skillfully integrating source material to support your arguments, ensuring that your voice remains central while drawing upon the expertise of others. This section will guide you through the intricacies of analyzing and synthesizing

information, maintaining an objective tone, and correctly integrating citations according to established style guides.

Analyzing and Synthesizing Chemical Information

The core of a strong chemistry literature review lies in your ability to analyze and synthesize the chemical information you've gathered. Analysis involves breaking down individual studies to understand their components: research questions, methodologies, results, and conclusions. Synthesis, on the other hand, is the process of combining these analytical insights from various sources to form a new, cohesive understanding of the topic.

When analyzing, ask critical questions about each source:

- What was the primary research question or hypothesis?
- What specific chemical compounds, reactions, or analytical techniques were employed?
- What were the key experimental results and observations?
- What conclusions did the authors draw, and are these conclusions fully supported by their data?
- What are the strengths and limitations of the study's methodology or interpretation?
- How does this study relate to or challenge other work in the field?

During synthesis, look for patterns, trends, discrepancies, and consensus across multiple studies. Instead of presenting each article in isolation, discuss how different papers contribute to a broader theme or debate. For example, "Smith et al. (2018) identified X mechanism, which was further supported by spectroscopic evidence from Jones (2019), though modifications were suggested by Chen (2020) based on computational modeling." This approach creates a dialogue among sources, demonstrating your comprehensive understanding and critical thinking in the context of chemical

literature.

Maintaining a Professional and Objective Tone in Chemistry Writing

Maintaining a professional and objective tone is paramount when writing a chemistry literature review. Scientific writing prioritizes clarity, precision, and impartiality, reflecting the empirical nature of the chemical sciences. Your goal is to present information and analysis in a manner that is factual and unbiased, allowing the evidence to speak for itself. Personal opinions, colloquialisms, or overly emotional language have no place in this academic format.

To achieve this, use formal language, avoid contractions, and choose precise scientific terminology. Attribute ideas and findings clearly to their original sources, refraining from presenting others' work as your own. When discussing conflicting findings, present both sides fairly and objectively, rather than dismissing one outright without strong, evidence-based reasoning. Focus on the data, the methods, and the interpretations, using phrases like "It has been demonstrated that..." or "Studies suggest..." rather than "I believe..." or "My opinion is..." This objective stance builds credibility and reinforces the authoritative nature of your chemistry literature review.

Integrating Citations and Adhering to Chemistry Style Guides

Properly integrating citations and strictly adhering to a recognized chemistry style guide are fundamental aspects of how to write a literature review chemistry. Citations acknowledge the work of others, avoid plagiarism, and allow readers to locate the original sources for further investigation. Failing to cite correctly or inconsistently applying a style guide can diminish the credibility and professionalism of your review.

The American Chemical Society (ACS) style guide is the most widely adopted for chemistry publications. Key elements of ACS style include specific formats for in-text citations (e.g., author-year, superscript numbers, or italicized numbers in parentheses) and detailed rules for formatting your bibliography or reference list. Ensure that all figures, tables, and chemical structures are also properly cited if they are adapted or reproduced from other works.

When integrating citations, strive for seamless flow. Instead of simply dropping a citation at the end of

a sentence, try to incorporate the authors' names or the reference number naturally into your narrative. For example: "The synthesis of compound Z was significantly improved by the catalytic method developed by Lee and colleagues (2019)." Or, "Recent investigations into enzymatic degradation pathways have revealed complex mechanisms (1-3)." Consistency across your entire review, from in-text citations to the final reference list, is critical and reflects meticulous academic practice.

Refining and Polishing Your Chemistry Literature Review

After completing the initial draft of your chemistry literature review, the work is far from over. The refining and polishing stage is crucial for transforming a good draft into an excellent, publishable-quality document. This phase involves a meticulous review of both content and presentation, ensuring clarity, coherence, accuracy, and adherence to all academic standards. It's an opportunity to critically assess your own work and incorporate external feedback, ultimately strengthening your argument and enhancing the readability of your review.

This iterative process of review, revision, and editing is a hallmark of professional scientific writing. It allows you to catch errors, improve sentence structure, clarify ambiguities, and ensure that your literature review effectively communicates your understanding of the chemical literature. Devoting sufficient time to this stage is a non-negotiable step in mastering how to write a literature review chemistry that stands out.

Critical Self-Assessment and Peer Review for Chemistry Papers

Once you have a complete draft of your chemistry literature review, engaging in critical self-assessment and, ideally, seeking peer review are invaluable steps for improvement. Self-assessment involves stepping back from your work and critically evaluating it from the perspective of an informed reader. Does it flow logically? Is the argument clear? Have you addressed your research question comprehensively?

Consider the following during self-assessment:

- Is the introduction engaging and does it clearly define the scope?
- Are the thematic sections logically organized and well-supported by evidence?
- Have I adequately analyzed and synthesized the information, rather than just summarizing?
- Is the conclusion insightful, identifying gaps and future directions?
- Is the tone consistently professional and objective?
- Are all sources cited correctly and consistently according to the chosen style guide?
- Are there any ambiguities or areas where clarity could be improved?

Peer review, whether from a colleague, mentor, or study group, offers an external perspective that can identify blind spots or areas of confusion you might have overlooked. They can provide feedback on clarity, coherence, logical flow, and even suggest additional relevant chemical literature. Embrace constructive criticism as an opportunity to enhance the quality and impact of your chemistry literature review.

Editing and Proofreading for Clarity and Accuracy in Chemistry

The final stage of refining your chemistry literature review involves rigorous editing and proofreading. This step focuses on correcting grammatical errors, punctuation mistakes, spelling discrepancies, and ensuring overall clarity and accuracy. Even minor errors can detract from the professionalism and credibility of your scientific writing, making careful proofreading essential.

When editing, pay close attention to:

- **Grammar and Syntax:** Ensure sentences are grammatically correct and that sentence structures are varied and clear.

- **Punctuation:** Check for correct use of commas, semicolons, colons, and apostrophes.
- **Spelling:** Proofread carefully, especially for chemical terminology, author names, and journal titles.
- **Clarity and Conciseness:** Eliminate jargon where simpler terms suffice, remove redundant words, and ensure every sentence contributes effectively to your argument.
- **Consistency:** Verify consistency in terminology, formatting, and citation style throughout the entire document.
- **Data Accuracy:** Double-check any numerical data, chemical formulas, or reaction schemes you have presented or referenced.

Reading your review aloud can often help identify awkward phrasing or errors that your eyes might miss. Taking short breaks during proofreading and returning with fresh eyes can also be highly effective. A polished, error-free literature review in chemistry demonstrates attention to detail, a hallmark of excellent scientific scholarship.

Common Challenges and Best Practices in Chemistry

Literature Reviews

Writing a comprehensive chemistry literature review often comes with its own set of challenges, from managing an overwhelming amount of information to ensuring ethical citation practices. Anticipating and understanding these common hurdles is the first step toward overcoming them. By adopting best practices, researchers can navigate these complexities more effectively, leading to a more robust, credible, and impactful literature review. This section addresses some typical difficulties encountered and provides strategies to mitigate them, further guiding you on how to write a literature review chemistry efficiently and ethically.

Overcoming these challenges not only improves the quality of your current review but also develops essential skills for future scientific endeavors. Learning to critically assess sources, manage vast datasets, and uphold ethical standards are invaluable assets for any professional in the chemical sciences.

Overcoming Information Overload and Bias in Chemistry Research

One of the most significant challenges when writing a chemistry literature review is information overload. The sheer volume of scientific publications can be daunting, making it difficult to discern truly relevant and high-quality sources from the less impactful. Another challenge is avoiding bias, both in your selection of sources and in your interpretation of findings.

To overcome information overload:

- **Refine your search strategy:** Use very specific keywords, advanced search operators, and database filters (e.g., publication date, journal impact factor) to narrow down results.
- **Prioritize peer-reviewed sources:** Focus on articles from reputable journals. Review articles can be excellent starting points for understanding the landscape and identifying key primary literature.
- **Skim efficiently:** Read abstracts, introductions, and conclusions first to quickly assess relevance before committing to a full read.
- **Develop a thematic outline early:** This helps you categorize and discard irrelevant information more effectively.

To mitigate bias:

- **Seek diverse perspectives:** Include studies that present conflicting results or different interpretations, not just those that support a pre-existing hypothesis.

- **Critically evaluate methodology:** Assess the rigor of experimental design and data analysis in each study, regardless of whether its conclusions align with your expectations.
- **Be transparent about limitations:** Acknowledge the limitations of the existing chemical literature and your own review.
- **Avoid confirmation bias:** Actively search for evidence that might challenge your assumptions, rather than just confirming them.

By proactively addressing these issues, your chemistry literature review will be more balanced, comprehensive, and scientifically rigorous.

Ethical Considerations in Citing and Referencing Chemical Literature

Ethical conduct is paramount in all scientific endeavors, and writing a literature review in chemistry is no exception. Proper citation and referencing are not just academic formalities; they are fundamental ethical responsibilities that uphold intellectual honesty and acknowledge the contributions of other researchers. Violations of these principles, such as plagiarism, can have severe academic and professional consequences.

Key ethical considerations include:

- **Avoiding Plagiarism:** Always attribute ideas, data, figures, and direct quotes to their original sources. Paraphrase effectively by rephrasing ideas in your own words while still citing the source.
- **Accuracy of Citations:** Ensure that all in-text citations correctly match the entries in your reference list and that all details in the reference list are accurate (author names, journal titles, page numbers, DOIs).
- **Citing Original Sources:** Whenever possible, read and cite the primary source of information,

rather than relying on secondary citations. If you must use a secondary source, make it clear (e.g., "cited in Smith, 2020").

- **Avoiding Self-Plagiarism:** Do not reuse significant portions of your own previously published work without proper attribution and, where necessary, permission from publishers.
- **Fair Representation:** Present the findings of others accurately and in context, without misrepresenting their conclusions to fit your own narrative.

Adhering strictly to these ethical guidelines ensures that your chemistry literature review is not only scientifically sound but also morally unimpeachable, reflecting the integrity expected within the chemical research community. Learning how to write a literature review chemistry ethically is as important as mastering its structure and content.

Mastering the art of how to write a literature review chemistry is an invaluable skill that underpins success in the chemical sciences. From the initial stages of defining a precise research question and conducting a thorough literature search to the final acts of critical analysis, synthesis, and meticulous proofreading, each step contributes to a robust and impactful review. The journey involves more than just summarizing; it's about critically evaluating, identifying gaps, and constructing a coherent narrative that positions your work within the broader scientific dialogue. By embracing the strategies for effective organization, maintaining an objective tone, and adhering to strict ethical guidelines for citation, you will produce a literature review that not only demonstrates your command of the subject matter but also contributes meaningfully to the advancement of chemical knowledge. This comprehensive approach ensures your review stands as a testament to your analytical prowess and commitment to scientific integrity, paving the way for future research and innovation in chemistry.

Q: What is the primary purpose of a literature review in chemistry?

A: The primary purpose of a literature review in chemistry is to critically synthesize existing scholarly work on a specific topic, thereby demonstrating the current state of research, identifying gaps in

knowledge, and establishing the theoretical and methodological context for new research. It shows that the researcher is aware of prior investigations and can build upon them.

Q: How do I start searching for chemical literature effectively?

A: Begin by clearly defining your research question or scope. Then, use specialized databases like CAS SciFinder[®], Web of Science, Scopus, and relevant publisher websites (e.g., ACS Publications) with precise keywords and Boolean operators (AND, OR, NOT). Utilize citation tracking (forward and backward) to find seminal papers and more recent developments in your area of chemistry.

Q: What are the key components of a well-structured chemistry literature review?

A: A well-structured chemistry literature review typically includes a compelling introduction that outlines the scope, thematic body sections that analyze and synthesize related studies, and a cohesive discussion/conclusion. The conclusion should summarize main findings, evaluate the literature, highlight gaps, relate to your research, and suggest future directions in chemistry.

Q: How can I avoid plagiarism when writing my chemistry literature review?

A: To avoid plagiarism, always attribute ideas, data, and direct quotes to their original sources through proper citation. Paraphrase effectively by rephrasing information in your own words, and ensure that all sources in your text are accurately listed in your reference section. Use a consistent citation style, such as ACS, and prioritize citing primary sources whenever possible.

Q: What is the difference between summarizing and synthesizing in a literature review?

A: Summarizing involves briefly restating the main points of an individual source. Synthesizing, on the other hand, means combining information from multiple sources to create a new, integrated understanding of a topic. In a chemistry literature review, you don't just list what each paper says; you discuss how different studies relate, contrast, or build upon each other to form a cohesive argument or reveal a larger trend.

Q: Which citation style is most commonly used for chemistry literature reviews?

A: The American Chemical Society (ACS) style guide is the most widely accepted and commonly used citation style for chemistry literature reviews and publications in the chemical sciences. It provides specific guidelines for in-text citations, reference list formatting, and presentation of chemical structures and data.

Q: How important is critical analysis in a chemistry literature review?

A: Critical analysis is extremely important. It goes beyond merely describing research; it involves evaluating the strengths and weaknesses of studies, assessing methodologies, interpreting data, and identifying inconsistencies or controversies in the chemical literature. This critical perspective demonstrates a deep understanding of the field and helps to justify the need for your own research.

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