



# Chapter 1

## Introducing Materials Science Articles

### ↳ Lead-in Questions

Answer the following questions based on your knowledge of research articles in your field:

1. How many sections are usually included in a research paper? What are they?
2. What is the purpose of each section?
3. In your opinion, which section is the most challenging to write? Which section is the easiest to write?

## ▶ 1.1 Article Structure

As you may have noticed, a materials science research article generally follows the conventional IMRD structure, namely, Introduction, Methods, Results, and Discussion. Beyond that, it also contains a title, an abstract, several keywords, a conclusion, and supplementary information.

### ▶ 1.1.1 A Concise and Informative Title

The title of a materials science paper is concise but informative. It usually contains the research purpose and key findings of the study. For example, in the title “Tunable, Ultrasensitive, and Flexible Pressure Sensors Based on Wrinkled Microstructures for Electronic Skins”, we can see that the researchers’ purpose is to develop a new pressure sensor based on certain microstructures that are tunable, ultrasensitive, and flexible, and this sensor can be used for electronic skins. It is important to remember that the use of abbreviations and complete sentences in titles is discouraged.

### ▶ 1.1.2 Abstract

The length of an abstract of a materials science paper is usually from 150 to 200 words, unstructured (i.e., no subtitles). The abstract should state the main purpose of the study, the methods used, the main results, and the key conclusion.

### ▶ 1.1.3 Keywords

Like in other research articles, authors need to provide 4 to 6 keywords, which can best summarize the main idea of the study or can be used for indexing purpose. Effective keywords include abbreviations or phrases that may not appear in the title or abstract and that link the work to wider fields of research.

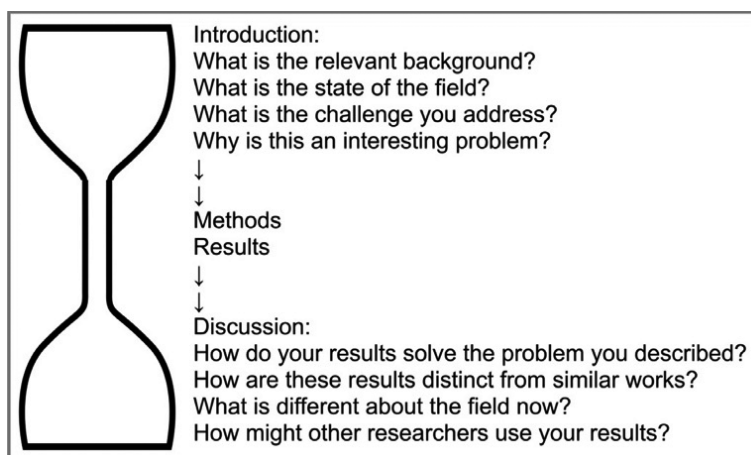
### ▶ 1.1.4 Main Body

The main body of a research article describes the original research, and is typically divided into the following sections:

- **Introduction:** This section provides a concise, up-to-date description of the background to give readers enough context to understand the research being presented and its significance. This section also provides an effective literature review, a specified research gap, a clearly stated research purpose, and a summary of the main results.

- **Materials and Methods:** This section is sometimes also called “Experimental” or “Procedure”, and some journals require the authors to place this part at the end of the research article. In this section, techniques, materials and equipment are described in great detail to show the credibility and validity of the study and to allow readers to replicate the study. Methods that are identical to the published procedures should still be summarized in brief, and the paper should include a citation to the original work.
- **Results and Discussion:** In materials science papers, the Results section is often presented together with the Discussion section. This section presents data or measurements related to answering the central research questions. The Discussion section often involves interpreting the results, comparing the results with previous findings, pointing out the implications of the results, considering their significance, and grounding them into a wider context to make contributions to the field. These two sections are, however, sometimes separated.
- **Conclusion:** A research paper is often ended with a Conclusion section, which states the main conclusions drawn from the research. Authors may also suggest future research directions in this section.

Figure 1.1 presents the overall structure of a materials science paper.



**Figure 1.1** The hourglass figure of a scientific manuscript, going from general, to specific, and back to general again, with potential questions to be addressed [Retrieved from Editorial (2019). How to write a compelling (materials) science paper. *Materialia*, 6.]

Other sections include “Acknowledgements”, which lists people who contribute to the work but who are not named as authors and funding sources that support the research; and “Supplementary Information”, which describes additional information omitted from the main body.