IUPAC and Wikipedia: A Story with Upsides, Downsides, Lessons & Rewards

by Stuart J. Chalk, Guido Raos, Paul D. Topham, and Martin A. Walker

A random person on the street may have never heard of IUPAC, but it is very likely that they have some familiarity with Wikipedia. This is extraordinary, as a sign how much the world has changed over the last twenty years, but it is not surprising.

Since its inception in 2001, Wikipedia has grown enormously in size, popularity and importance. For most people around the world, "the free encyclopedia that anyone can edit" is the first and foremost source of independent information on science, technology, arts, history, sports, entertainment, and much more. For several years, it has been consistently within the 7-8 most visited sites on the internet, after giants such as Google, YouTube, and Facebook [1]. An internet search for a technical term is also very likely to return the link to a Wikipedia article, as one of the first two or three options.

As emphasized by its logo (Figure 1), Wikipedia is a decentralized, international, multi-lingual endeavor. In fact, there are more than 300 Wikipedias in different languages [2]. The most populated and visited Wikipedia is that in English (almost seven million articles at the time of writing this article), but there are currently another 17 Wikipedias with more than one million articles. The Wikipedia foundation has also launched and supports several "sister projects", such as Wikimedia Commons, Wikidata, Wikiquote, Wiktionary, *etc.*. The international nature of this wide-ranging project and the aim of spreading and sharing knowledge have a clear affinity with IUPAC's mission and history.

Since 2015, recognizing the importance of Wikipedia as a vehicle for scientific information and dissemination, the Polymer Division of IUPAC (Division IV) has sponsored two projects related to embracing Wikipedia to disseminate knowledge:
- Synchronizing Wikipedia: Polymer Definitions and Terminology (https://iupac.org/project/2015-032-2-400/).
- Hands-on training on Wikipedia and Wikidata for application of IUPAC terms across Wikipedia (https://iupac.org/project/2018-038-1-400/).

The first project is the follow-up to a previous one by the Subcommittee for Polymer Terminology (SPT), that was covered 10 years ago in another article in *Chemistry International* [3]. The aim was to check polymer-related articles on Wikipedia—there are hundreds of

Figure 1: The Wikipedia logo

them—for accuracy, especially with respect to the use of polymer terminology, and if necessary correct or improve them. Relevant IUPAC definitions were also inserted in text boxes, with links to the original publications. The presence of the formal definition of a concept next to more extended explanations within an article allows the readers to better appreciate both of them. The boxes also increased the visibility of IUPAC's work on terminology.

Shortly before the breakout of the COVID-19 pandemic in 2020, the project came to a standstill when some Wikipedia administrators [4] flagged the text boxes with the IUPAC definitions for plagiarism and possible copyright violations. The reason is that definitions had been copied *verbatim*—as one should do, for an official definition—from old technical documents with copyright restrictions. A few years ago, IUPAC and its publisher (De Gruyter) reached an agreement to publish new documents with an open access policy [5], but even in this case there were some restrictions on the re-use of the material that is not compatible with Wikipedia policies (the CC-BY-NC-ND license forbids commercial and derivative work) [6].

Call for Wikipedia editors

If you are interested in contributing to the dissemination of IUPAC definitions while becoming a Wikipedia editor, please reach out to Guido Raos. The next editing course at the Politecnico di Milano will take place the week of 8-12 July; online attendance is also possible.
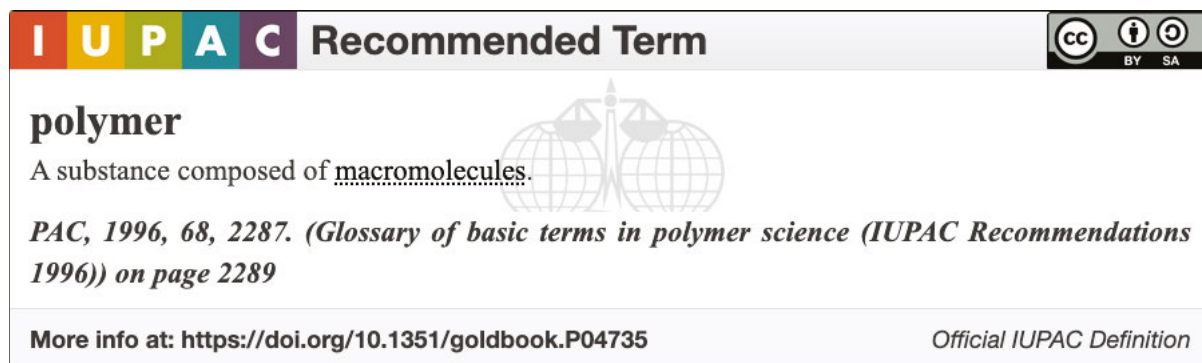
Figure 2: Image of a definition extracted from the IUPAC Gold Book for use in Wikipedia.

A possible solution to this problem came after a couple of years, when after consultation with the Committee on Publications and Cheminformatics Data Standards (CPCDS), IUPAC decided that images containing definitions from the Gold Book could be released with a Creative Commons license that is fully compatible with Wikipedia (CC-BY-SA) [7]. Figure 2 contains an example of such an image. Following this decision, about 70 images were generated, uploaded on Wikimedia Commons, and subsequently (early in 2024) inserted within a comparable number of relevant Wikipedia articles. Compared to the text boxes, the images also have a certain aesthetic appeal. Unfortunately, even this solution generated some negative reactions by some Wikipedia editors, to the point that some of the images were deleted from the articles. Among the reasons for the complaints, was the size of the images (the images could take up too much space within the articles, especially when consulted from a mobile device) and poor accessibility to the definitions by blind readers. At first, these negative reactions generated some understandable disappointment, as some of us believed that we had reached a dead end of the project. However, this was recently revived by IUPAC's decision that the Gold Book (including the text of the definitions, not just the images derived from them) could be released with the CC-BY-SA license [8]. This re-opens the possibility of going back to the text boxes, with an updated format.

The second project is sponsored by the Subcommittee for Polymer Education (SPEd), also from the Polymer Division (Div IV). It is a spin-off of a Wikipedia-editing course, that one of us has co-organized yearly at the Politecnico di Milano since 2016. Nearly 300 graduate students from the Politecnico have taken the course, whereby over the course of a week, they learn about Wikipedia and how to contribute to it, writing new articles, or improving and expanding existing ones (*e.g.,* those classified as "stubs"). The topics of the articles extend across all disciplines taught at the Politecnico: science, engineering, design and architecture. The rationale of the course is that it increases the technical writing abilities of the students and it renders them better, more critical users of Wikipedia's contents. Editing Wikipedia also allows us to give back to society and reach out to many more people, compared to a scientific publication.

The IUPAC project has allowed eight visitors to attend the course in Milano, learn the basic rules and contribute with articles on polymer-related topics. Some of the articles are rather general, such as "Polymer" [9], whereas others can be much more technical and specific (*e.g.*, "Chain transfer" [10]). At the time of writing, the Polymer page still contains the image with the definition in Figure 2, while the Chain transfer page features an old-fashioned text box. The impact of the editing work can be appreciated from the statistics on page visits. Over the last month, the Polymer article has been getting over 1200 visits per day, the Chain transfer one a respectable 30 visits per day.

In conclusion, the collaboration of IUPAC and Wikipedia has been at times difficult. There are undoubtedly some cultural and technical barriers, some of which were not expected but can nonetheless be overcome by patient work and discussion. The rewards are already tangible, in terms of visibility for IUPAC and for our scientific work.

References and Notes
1. See e.g. https://www.similarweb.com/top-websites/ (accessed on 25 March 2024).
2. See https://www.wikipedia.org (accessed on 25 March 2024).
3. "Synchronizing Polymer Definitions and Terminology with Wikipedia" *Chem. Int.* 2014, 36(2), 19; https://doi.org/10.1515/ci.2014.36.2.19
4. A Wikipedia administrator is a user with special editing

part to add terms related to qualitative ("nominal") properties. Determination of properties such as chemical or biological species identity (for example, confirmation of identity of drugs of abuse or of pathological bacterial species) are covered by different accreditations standards, and IUPAC has published a vocabulary relating to nominal properties [10]. The aim of the VIM revision is to adapt this vocabulary to a wider range of measurement fields. Other topics for the VIM revision include changes leading from the most recent edition of the SI Brochure, in particular on units for "dimensionless quantities" (those for which all SI units cancel, like mass fraction or other ratios) and from the recent redefinition of the SI, and revision of concepts related to the idea of physical quantities (length, time, *etc.*) and their values. Some of these changes have proven contentious and generated a considerable volume of comments; WG2 accordingly expect to provide a further consultation draft later in 2024 after addressing the most recent comments.

Finally, it is worth pointing out that for IUPAC to form a clear view of IUPAC members' needs and views on these key documents, and for those views to carry weight in the working groups, it is vital that individual members take time to check the drafts and to lodge comments. Both WG1 and WG2 always issue draft documents to member organisations, including IUPAC, and allow generous timescales for comment. Both JCGM and IUPAC want documents to serve their communities well; that cannot be done unless members participate actively in their development.

References

1. JCGM 100:2008, Evaluation of measurement data — Guide to the expression of uncertainty in measurement. BIPM (2008)

2. JCGM 200:2012, International vocabulary of metrology – Basic and general concepts and associated terms (VIM) 3rd edition. BIPM (2012)

3. ISO/IEC 17025:2017, General requirements for the competence of testing and calibration laboratories. ISO, Geneva (2017)

4. Compendium of Terminology in Analytical Chemistry, IUPAC Orange Book, prepared for publication by D Brynn Hibbert, The Royal Society of Chemistry, 2023 [ISBN 978-1-78262-947-4]; https://doi.org/10.1039/9781788012881

5. JCGM 101:2008, Evaluation of measurement data — Supplement 1 to the "Guide to the expression of uncertainty in measurement" —Propagation of distributions using a Monte Carlo method (BIPM, 2008)

6. JCGM 102:2011 Evaluation of measurement data – Supplement 2 to the "Guide to the expression of uncertainty in measurement" – Extension to any number of output quantities (BIPM, 2011)

7. JCGM 106:2012 Evaluation of measurement data – The role of measurement uncertainty in conformity assessment (BIPM, 2012)

8. JCGM GUM-6:2020 Guide to the expression of uncertainty in measurement — Part 6: Developing and using measurement models (BIPM, 2020)

9. JCGM GUM-1:2023 Guide to the expression of uncertainty in measurement — Part 1: Introduction (BIPM, 2023)

10. Nordin, G., Dybkaer, R., Forsum, U., Fuentes-Arderiu, X. and Pontet, F.. "Vocabulary on nominal property, examination, and related concepts for clinical laboratory sciences (IFCC-IUPAC Recommendations 2017)" *Pure and Applied Chemistry* 2018, 90(5), 913-935; https://doi.org/10.1515/pac-2011-0613

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privileges, such renaming, deleting or protecting some pages, or blocking some users. They are volunteers selected by the community among its more trust-worthy and experienced editors. A Wikipedia editor is anyone who contributes to it by writing and editing its contents. Wikipedia has some well-defined rules but, unlike a scientific journal, it has no official and centralized "editor's office" that decides what is publishable and what is not.

5. See, for example: Jan Kaiser, David Brynn Hibbert, and Jürgen Stohner. "Preparation, formatting and review of IUPAC Technical Reports and Recommendations, IUPAC-sponsored books, or other items carrying the IUPAC label" *Pure App. Chem.* 2022, 94(11-12), 1257-1267; https://doi.org/10.1515/pac-2022-1106

6. See https://creativecommons.org/licenses/by-nc-nd/4.0/ (accessed on 25 March 2024).

7. See https://creativecommons.org/licenses/by-sa/4.0/ (accessed on 25 March 2024).

8. See https://goldbook.iupac.org/ (accessed on 25 March 2024).

9. https://en.wikipedia.org/wiki/Polymer (accessed on 25 March 2024).

10. https://en.wikipedia.org/wiki/Chain_transfer (accessed on 25 March 2024).

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