Macromolecular Nomenclature and Terminology

A Brief History of IUPAC Activities

With the preparation of a revised edition of the so-called "Purple Book"—the *Compendium of Macromolecular Nomenclature*—well underway, the secretaries of the former IUPAC Commission on Macromolecular Nomenclature have drafted the commission's history and reviewed 50 years of activities.

by Máximo Barón, Norbert Bikales Bikales, Robert Fox, and William Work

From the 1920s, as polymer science developed and came of age, so too a common language came into being through the efforts of individuals who recognized the need for such a language. They formed committees to consider issues that included not only systematic nomenclature, but terminology and definitions, symbols, and other matters that might affect communication. All of this effort forms a part of the prehistory of the work of the Macromolecular Division on Nomenclature and Terminology.

Subcommission on Nomenclature

IUPAC's first report on macromolecular nomenclature was published in 1952 by the Subcommission on Nomenclature of what was then the IUPAC Commission on Macromolecules. That report,[1] which drew on the talents of such remarkable individuals as J. J. Hermans, M. L. Huggins, O. Kratky, and H. F. Mark, was a landmark in that, for the first time, it systematized the naming of macromolecules and certain symbols and terms commonly used in polymer science. It introduced the use of parentheses in source-based polymer names when the monomer from which the polymer is derived consists of more than one word, a practice that is now widely followed. The report also recommended an entirely new way of naming polymers based on their structure that included the suffix "amer," a recommendation that has been almost totally ignored. After 10 years, the subcommission issued its second report,[2] which dealt with the then-burgeoning field of stereoregular polymers. A revision[3] of definitions in the original report appeared four years later. In 1968, a summary report[4] of the activities of the subcommission was published.

Commission on Macromolecular Nomenclature (Commission IV.1)

In 1968, the Commission on Macromolecular Nomenclature of the Macromolecular Division (Division IV) was established under the chairmanship of K. L. Loening. L. C. Cross was initially secretary and then R. B. Fox. A series of major documents was produced that shaped modern polymer language. Most noteworthy was one that defined basic terms[5,6] and another on structure-based nomenclature for regular single-strand polymers.[7,8] The latter, originally developed by the Nomenclature Committee of the Polymer Division of the American Chemical Society and refined by the Commission, revolutionized polymer nomenclature by providing a systematic, consistent scheme particularly well adapted to indexing; it became the standard for *Chemical Abstracts* and major polymer journals throughout the world. A list of standard abbreviations was published[9-11] and later revised.[12]

As the 1970s came to a close, A. D. Jenkins assumed the chairmanship, with R. B. Fox continuing as secretary through 1979, to be succeeded by N. M. Bikales, who served until 1987. In the 1980s, the Commission produced a complete revision of the stereochemical definitions;[13-14] terminology for molar masses in polymer science;[15] an extension of structure-based nomenclature to inorganic and coordination polymers;[16-17] the systemization of source-based nomenclature for copolymers; [18] two key documents dealing with physicochemical terminology in the polymer field, one covering definitions for individual macromolecules, their assemblies, and dilute solutions[19] and the other concerned with crystalline polymers;[20] a new method of classifying polymers;[21] and a basic classification and definitions of polymerizations reaction.[22] These documents were completed under the chairmanship of P. Kratochvíl, who assumed those duties in 1985; W. J. Work was elected

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Secretary in 1987. In 1991, the first edition of the *Purple Book*[23] was published. The compendium was the first major compilation of the commission and consisted of an introduction to macromolecular nomenclature and nine chapters corresponding to the then valid IUPAC recommendations.

The final decade of the century saw the activity of the Commission continue unabated. R. F. T. Stepto succeeded to the chairmanship in 1991, and he, in turn, was succeeded by M. Hess in 2000. M. Barón became secretary in 1998. Graphical representation of polymer structures was addressed for the first time in 1994.[24] In the course of this decade, a revised and enlarged glossary of basic terms[25] was published, along with definitive documents dealing with the terminology of polymer aging and degradation[26] and non-ultimate mechanical properties;[27] terminology concerned with liquid-crystal polymers was also published.[28,29] In the field of structure-based nomenclature, the commission published recommendations covering regular double-strand polymers[30] and irregular single-strand polymers,[31] and a revision of the commission's 1975 rules for structure-based nomenclature[8] was completed.[32] In 1997, a document concerned with a new area, source-based nomenclature for nonlinear macromolecules and macromolecular assemblies,[33] was published. A document on definitions relating to stereochemically asymmetric polymerizations[34] was prepared in 2000. A document on source-based generic nomenclature for macromolecules[35] was published in 2001.

At the end of the 1990s, the commission had formed active Working Parties considering many new aspects of polymer science. In various stages of preparation were documents concerned with the terminology or nomenclature of polymer composites and blends, inorganic composites, hyperbranched macromolecules, and cyclic macromolecules (including macromolecular rotaxanes and catenanes). Definitions in the fields of kinetics and thermodynamics of polymerization, and polymerization processes and polymers in dispersed systems were under consideration. A general guide to polymer terminology and nomenclature and a document on polymer class names were nearly complete.

Subcommittee on Macromolecular Terminology

Effective 1 January 2002, the Bureau and Council of IUPAC decided to form a new Division of Chemical Nomenclature and Structure Representation (Division VIII) to deal with nomenclature in an integrated manner across all branches of chemistry. In keeping with this change and the change to project-based funding, the Commission on Macromolecular Nomenclature decided to become the Subcommittee on Macromolecular Terminology of Division IV. The development was timely as it reflected the change in the emphasis of the work the commission was carrying out. Over the last decade, under the chairmanship of R. F. T. Stepto and M. Hess, the majority of projects had been concerned with terminology, related particularly to polymer and polymer-based materials. However, the subcommittee also continues to work on macromolecular nomenclature in collaboration with the new Division VIII. With the current feasibility studies underway and the projects due to be completed, it may be expected that the next decade and beyond will see a continued proliferation of recommendations dedicated to the improvement of communication in polymer science.

Translations of Nomenclature and Terminology Recommendations

Although the nomenclature and terminology recommendations have all been published in English, those involved with the publishing have purposefully pursued their further dissemination and discussion in other languages, including Chinese, Croatian, Czech, French, German, Japanese, Korean, Polish, Portuguese, Russian, and Spanish. Over the years, there has been no doubt about the global influence of the recommendations on the language of chemistry. A list of translations can be obtained from <www.iupac.org/divisions/IV/compendium.html>.

A list of members of the commission can be obtained at <www.iupac.org/divisions/IV/IV.1/history.html>.

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Máximo Barón <baron@ub.edu.ar > is professor at the Universidad de Belgrano, in Buenos Aires, Argentina, and the current secretary of the IUPAC Subcommittee on Macromolecular Terminology. Questions, comments should be returned to him.

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