The Project Place

A critical review of the proposed definitions of fundamental chemical quantities and their impact on chemical communities

The objective of this project is to provide a Technical Report containing a critical review of the definitions for the quantity amount of substance and its unit, mole, as well as the related unit of the quantity mass.

The work will consist of the compilation of existing published work related to the definition of the quantity amount of substance, its unit, and the consequence of these definitions on the unit of the quantity mass. The compilation will be reviewed critically with the aim of assembling all possible elements in order to judge the adequateness of the existing definitions or new proposals. Compilation and critical review shall rely on the broadest spectrum of interested IUPAC members. Therefore, all divisions will be invited to participate in the project, as well as the Interdivisional Committee on Terminology, Nomenclature and Symbols (ICTNS) and Committee on Chemistry Education (CCE). All task group members will have a mandate to speak on behalf of their corresponding communities. External experts will be consulted.

The task group is scheduled for discussions in the Consultative Committee for Amount of Substance, or Comité consultatif pour la quantité de matière (CCQM) and the International Bureau of Weights and Measures (BIPM) on the new definition of the mole. A time horizon of 2015 for establishing a firm position of IUPAC with regard to this question is adequate for further decisions to be taken by CCQM, the International Committee for Weights and Measures or Comité international des poids et mesures (CIPM), and the General Conference on Weights and Measures (Conférence Générale des Poids et Mesures, CGPM).

In June 2014, the task group initiated a survey to collect opinions and comments by the IUPAC National Adhering Organizations (NAOs). The questionnaire focuses on the current definition of the mole, the new definition of the mole, the current definition of the quantity amount of substance, and the current name of the quantity amount of substance. NAOs are asked to reply **no later than 1 October 2014**. The questionnaire is available from the project webpage below.

For more information, contact the Task Group Chair Jürgen Stohner <sthj@zhaw.ch> or email <mole@iupac.org>

www.iupac.org/project/2013-048-1-100

On the definition of the mole

In 1971, the 14th General Conference of Weights and Measures resolved to define the mole as "the amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kilogram of carbon 12..." In addition, "when the mole is used, the elementary entities must be specified and may be atoms, molecules, ions, electrons, other particles, or specified groups of such particles." This is the current definition of the mole.[1]

In 2011, the 24th General Conference of Weights and Measures proposed a revision of the SI. As a consequence of this, the redefinition of the mole is necessary and its magnitude will be set "by fixing the numerical value of the Avogadro constant to be equal to exactly 6.022 14X × 10^{23} when it is expressed in the SI unit mol^{-1}." The symbol X represents one or more additional digits to be added to the numerical value of N_A. This is the proposed new definition of the mole.[2]

Mole is the name of the SI base unit (symbol mol) for the base quantity *amount of substance* (symbol *n*) which is defined in IUPAC documents (e.g. IUPAC Green Book, 3rd Edition, 2nd Printing 2008)[3] using the expression $n = N/N_A$, where N is the number of entities, and N_A is the Avogadro constant. Similarly, the SI Brochure (8th Edition 2006)[1] provides the following definition of the quantity *amount of substance*:

"Amount of substance is defined to be proportional to the number of specified elementary entities in a sample, the proportionality constant being a universal constant which is the same for all samples ... This constant is called the Avogadro constant, symbol N_A or L ... the relation is $n = N/N_A$. ... the Avogadro constant has the coherent SI unit reciprocal mole."

References

1. www.bipm.org/en/si/si_brochure/
2. www.bipm.org/en/CGPM/db/24/1/
3. www.iupac.org/home/publications/e-resources/nomenclature-and-terminology/quantities-units-and-symbols-in-physical-chemistry-green-book.html