Standard Atomic Weight of Lead Revised

Following the recent publication of the IUPAC Technical Report on the variation of lead isotopic composition and atomic weight in terrestrial materials [1], the IUPAC Commission on Isotopic Abundances and Atomic Weights (CIAAW) is recommending changes to the standard atomic weight (i.e., relative atomic mass) of lead:

lead: to [206.14, 207.94] from 207.2 ± 0.1

The assignment of an interval for the new standard atomic weight reflects the common occurrence of variations in the atomic weights of lead in normal terrestrial materials which have been known for over a century [2]. If a single atomic-weight value is needed, the Commission recommends using 207.2 ± 1.1, which corresponds to the common lead with a symmetric uncertainty covering normal materials.

The isotopic composition and atomic weight of lead are variable in terrestrial materials because its three heaviest stable isotopes are stable end-products of the radioactive decay of uranium (238U to 206Pb and 235U to 207Pb) and thorium (232Th to 208Pb). These variations in isotope ratios and atomic weights provide useful information in many areas of science, including geochronology, archaeology, environmental studies, and forensic science. While elemental lead can serve as an abundant and homogeneous isotopic reference, deviations from the isotope ratios in other lead occurrences limit the accuracy with which a standard atomic weight can be given for lead. In a comprehensive review of several hundred publications and analyses of more than 8000 samples [1], published isotope data indicate that the lowest reported lead atomic weight of a normal terrestrial material is 206.1462 ± 0.0028, determined for a growth of the phosphate mineral monazite from the Lewisian complex in north-western Scotland, which contains mostly 206Pb and almost no 204Pb [3]. The highest published lead atomic weight is 207.9351 ± 0.0005 for monazite from a micro-inclusion, also from the Lewisian complex in north-western Scotland, which contains almost pure radiogenic 208Pb [3].

The CIAAW continues to evaluate literature data which leads to identification of developments in the measurement science, recognition of new discoveries, and remains committed to modernize its technical guidelines and work towards further expansion of its website to include more historical databases.

These changes and considerations will be published in Pure and Applied Chemistry and can be found online at the website of the IUPAC Commission on Isotopic Abundances and Atomic Weights (ciaaw.org).

References


https://iupac.org/standard-atomic-weight-of-lead-revised/

PAC Cheminformatics Special Issue

Pure and Applied Chemistry Special Issue—Call for Papers: Cheminformatics: Data and Standards.

IUPAC has long helped advance cheminformatics and chemical data standards. Examples include the development of the InChI chemical identifier and the JCAMP-DX family of spectroscopic data formats. These formats continue to evolve based on current needs of the community, and new cheminformatics standards initiatives are launching within IUPAC and related organizations, which seek to address gaps in, for example, chemical file formats, chemical metadata standards, and machine-readable data sharing. Cheminformatics standards advance research and teaching, and also facilitate the implementation of chemical processes.

This special issue seeks to continue the conversation around cheminformatics standards development, with the aim to review current standards available, as well as discuss future needed standards. Clearly identifying our current successes and limitations in