CHEMICAL TERMINOLOGY

CHEMICAL TERMINOLOGY AND USAGE are governed by the International Union of Pure and Applied Chemistry (IUPAC). Various commissions within the IUPAC periodically update, revise, or clarify terminology in many areas of specialty. These revisions appear as recommendation articles in "Pure and Applied Chemistry," the official journal of the IUPAC. Recommendations published through 1979 are available in a handbook (International Union of Pure and Applied Chemistry, 1979), which is commonly referred to as the "green book" of the IUPAC. Recent editions of the Chemical Rubber Company's (CRC) "Handbook of Chemistry and Physics" (Weast, 1984) also contain much of this information.

Chemical names, rather than symbols, are generally used in text except for the following:

1 In a list, if the name list exceeds five elements, atomic symbols should be used for the sake of brevity: Analysis shows the presence of Mg, Sb, Rb, Pt, Ag, and Au.
2. In a complex term: Ca-Mg-SO_3-NO_3 solution.
3 In proximity: Ca^+ and Mg^+ ions combine with CO_3^- and SO_4^-, respectively.

Symbols should also be used in tables and equations and within text where failure to do so would result in complex or ambiguous terms. A table of atomic names, symbols, and weights (International Union of Pure and Applied Chemistry, 1984) is reproduced in table 2, in the section on "Abbreviations, Signs, and Symbols."

Correct usage of chemical symbols as dictated by the International Union of Pure and Applied Chemistry is illustrated as follows:

$${}^{1}_{2}Ca^{3}_{4}$$

Field	*Contents*
1	mass number
2	atomic number (usually omitted)
3	charge
4	number of atoms

Isotopes are commonly designated by the atomic number (the number of protons in the nucleus) and the mass number (the sum of the protons and neutrons in the nucleus). The custom of writing the mass number as a left superscript, as ^{14}C, is gradually becoming universal. Ratios, however, are generally more readable if the superscript follows the symbol, as Rb^{85}/Rb^{87}. Thus, an admixture of the two practices, even in the same paper, seems permissible. If the author chooses to use the form Rb^{85}/Rb^{87}, it should be used consistently for all ratios. Where the full name of an element is used in text matter, the mass number is presented with a hyphen, as carbon-14. The atomic number is commonly omitted but, if used, is written as a left subscript: $^{14}_{6}C$. Ionic charge is always indicated as a superscript numeral followed by a plus or minus sign.

IUPAC rules call for use of Greek terms for adjectives and prefixes pertaining to valences and other stoichiometric properties. Thus "monovalent," "divalent," "trivalent," "tetravalent," "pentavalent," and "hexavalent" are preferred.

The results of chemical analyses of rocks and minerals are generally reported in terms of weight percent of the oxides present. This practice naturally leads geologists to describe chemical changes in terms of the oxides, as "The introduction of silica and alumina during metasomatism * * *." This usage is generally proper, but inconsistencies may arise because there is no convenient term for total iron oxides. Consider, for example the sentence "Silica, magnesia, and iron were introduced," in which two oxides and one element are mentioned. Such difficulties can be avoided by describing chemical changes in terms of elements or perhaps by using the chemical symbols for the several oxides.

Any table reporting chemical analyses should clearly distinguish between reporting oxides and ions. Most researchers follow the reporting scheme used in Deer and others (1966) in which analyses are reported from highest to lowest oxidation-state cations (as oxides) followed by anions. The rare earth elements should never be referred to as rare earths. A rare earth is an oxide of a rare earth element; hence, the two terms are not interchangeable. Rare earths are generally reported together as a group.

The words "analyze" and "analysis" are often misused for "determine" or "determination." A report of "15 copper analyses" properly refers to 15 samples of copper ore that were analyzed for copper or for other elements; a report on the copper content of 15 rocks should refer to "15 copper determinations."

The spellings "sulfur," "sulfide," and "sulfate" have replaced the older spellings "sulphur," "sulphide," and "sulphate." "Beryllium (Be)" and "niobium (Nb)" have replaced the names "glucinium (Gl)" and "columbium (Cb)," but "columbium" is still correct in some technical references such as to ferrocolumbium alloys (and the mineral columbite, which contains niobium as an essential element, is still called columbite). "Mercury" is the correct term for the chemical element, but "quicksilver" is correct in technical or industrial usage.

The term "lime" (CaO) is commonly misused for calcium (Ca). "Soda," meaning sodium carbonate (Na_2CO_3), and "potash," meaning potassium carbonate (K_2CO_3), are also commonly misused, both when the elements are meant, as in "potash feldspar," and when the oxide is meant, as in "The analysis shows 4.35 percent potash," meaning potassium oxide (K_2O). Be explicit, therefore, and write "potassium oxide" and "potassium carbonate" when referring to these compounds. In technical usage, the term "potash," as in "potash deposits of the United States," is deeply entrenched and should be retained.