Critical Evaluation of Stability Constants for α-Hydroxycarboxylic Acid Complexes with Protons and Metal Ions and the Accompanying Enthalpy Changes Part II: Aliphatic α-Hydroxycarboxylic Acids (IUPAC Technical Report)

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The hydroxycarboxylic acids and their derivatives are important chemicals for the pharmaceutical, biological, food, and other industries. Various hydroxycarboxylic acids occur naturally. The technological, practical, and industrial applications of these compounds have led to numerous studies of their properties and characteristics.

The hydroxycarboxylic acids contain two donor groups, the hydroxyl and the carboxylate groups, and therefore are all potentially bidentate ligands. The proton and metal ion complexation constants of these ligands depend strongly on the relative positions of the two donor groups in the molecule. The α-hydroxycarboxylic acids form considerably stronger complexes with most metal ions, through bidentate chelation involving both functional groups, than do the corresponding simple carboxylic acids. Hydroxyl groups more distant from the carboxylic groups do not generally participate in the formation of chelate complexes, and the ligand coordination to metal ions occurs via the carboxyl group only.

The hydroxycarboxylic acids form stable complexes with most metal ions. Owing to the considerable amount of reported data, in the form of protonation and metal ion binding constants, the critical evaluation of the equilibrium data in this paper is restricted to proton and metal ion complexation with aliphatic monoprotic α-hydroxycarboxylic acids, in aqueous solution, published between 1960 and 1994. Little relevant data that was published earlier are included in this paper. Enthalpy changes, when available, are also reported. Equilibrium data obtained in non-aqueous or in solvent mixtures, as well as those dealing with the formation of mixed complexes, are not surveyed in this paper.

Many determinations of acid dissociation constants and metal ion complexation constants with hydroxycarboxylic acids have been reported. Various experimental methods have been used for the measurements, mainly potentiometry, spectroscopy, and distribution between two phases. Several studies were carried out in media of constant ionic strength (commonly in the range 0.1 - 2.0 mol dm^{-3}), the supporting electrolytes being sodium perchlorate, but also sodium chloride, potassium chloride, and nitrate. The majority of the measurements were performed at 25 °C.

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Endocrine Disruptors in the Environment (IUPAC Technical Report)

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Many chemical substances of natural or anthropogenic origin are suspected or known to be endocrine disruptors, which can influence the endocrine system of life. This observation has led to an increased interest on the part of the public and the media, as well as to a steep rise in research activities within the scientific community. New papers and results are presented so quickly that it is impossible to give a complete review of this emerging research field. Therefore, this paper tries to provide insight into several topics that encompass the great scope of endocrine disruptors in the environment.

The paper explains some parts of the endocrine systems of mammalians and non-mammalians in order to provide general biochemical and biological background information. Important mechanisms of endocrine disruption, such as interactions with hormone receptors, are described. Strategies for testing anthropogenic chemicals on various organisms are critically reviewed with respect to their problems and gaps. The main emphasis of the paper involves chemical substances that are suspected or known to be endocrine disruptors. Physicochemical data, such as water solubility, as well as information about their use and/or function, are reviewed and compared to provide a clearer picture of their behavior in the environment. The paper also describes the main routes of exposure for most chemicals and provides data related to concentrations in the environment (soil/sediment, water).

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