DETERMINATION OF THE COMPLEXATION CONSTANTS OF COPPER AND ZINC WITH EDTA AT 298.15 AND 288.15 K

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Ethylenediaminetetraacetic acid (EDTA) is a versatile and widely used complexing agent due to its ability to form stable chelate complexes with various metal ions. Studying the thermodynamics of complexation of ions such as copper, and zinc with EDTA is particularly relevant in the context of the development of modern chelated micronutrient fertilizers. With a set of experimental data on the true stability constants of complexes, calculations with high predictive power are possible. By parameterizing thermodynamic models with a small number of components and then combining them according to the pyramid principle, a thermodynamic model of a complex multicomponent system is constructed.

Despite numerous studies in the field of complexation, the thermodynamic parameters of complex formation of metal ions such as copper, and zinc with EDTA remain poorly understood at temperatures different from room temperature.

Experimental studies of complex formation were carried out using potentiometric titration at temperatures of 288.15 K and 298.15 K by using a TitroMatic 1S autotitrator and an ESK-10604 combined glass electrode. A metal-to-ligand concentration ratio of 1:1 or 1:2 was considered at different concentration levels. To accurately determine the content of metal ions in solutions, complexometric titration was carried out using standard methods with indicators.

To determine the protonation constants of the EDTA acid residue at a given temperature and ionic strength, a series of titrations of EDTA solution were carried out in the absence of metal cations.

The obtained potentiometric curves were processed using the AUTOEQUIL software package.

The obtained experimental data expand the database for modeling multicomponent systems containing chelated complexes. The established patterns of temperature influence on the stability of the complexes allow us to predict the behavior of chelated forms of micronutrients under real-world conditions.

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