

Relationship Between Ionic Strength Dependence Patterns, Stability and Structure of Some Dioxovanadium(V), Molybdenum(VI) and Tungsten(VI) Complexes with Aminoacids and Aminopolycarboxylic Acids in Different Sodium Perchlorate Aqueous Solutions

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It is now recognized that molybdenum(VI), dioxovanadium(V) and tungsten(VI) found in enzymes in microorganisms, plants and animals play an important biochemical role. As a result, interest in coordination of these metals has increased recently. There are some studies about their complexes with amino acids (phenylalanine and glutamic acid) and aminopolycarboxylic acids (iminodiacetic acid(IDA), nitrilotriacetic acid(NTA) and ethylenediaminediacetic acid(EDDA)) at different ionic strengths [1-6] but to our knowledge no reports of the relationship between ionic strength dependence patterns and structure of these complexes in aqueous solution have appeared. We are looking for a correlation between ionic strength dependence patterns and structures of the complexes, if there is one.

Stability constants of the formed complexes between molybdenum(VI) and tungsten(VI) with glutamic acid, IDA, NTA and EDDA have been calculated at 25°C and different ionic strengths ranging from (0.1 to 1.0) mol dm⁻³ of sodium perchlorate. In Mo(VI) complexes the pH was justified to 6.0 but in W(VI) complexes the pH was fixed at 7.5. A combination of potentiometric and spectrophotometric techniques has been used based on the continuous variations method. According to these investigations the metal to ligand ratio is 1:1. For the dioxovanadium complex two equilibrium models, ML and ML₂⁻ were assumed. Dioxovanadium complexes with phenylalanine in the aforementioned ionic strength range, pH=1.30-10.0 and various temperatures with a range of 25-35°C have been studied and thermodynamic functions have been calculated. Ionic strength dependence of stability and dissociation constants has been evaluated using a Debye-Huckel type equation and by introducing two empirical parameters. All of the calculations have been done by the computer program Excel 2000, with high values of correlation coefficients, on the basis of minimizing the error function and the Gauss-Newton nonlinear least-squares method. There are approximately same ionic strength dependence patterns for these complexes except for W(VI)-NTA complex which has a maximum point in the ionic strength dependence curve. Ionic strength dependence results allow us to speculate on the structure of the complexes obtained.

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