

Calorimetric Study of Dithiocarbamate Complexes with Essential and Toxic Metal Ions

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Dithiocarbamates are a class of molecules with important chemical and biological properties. They are currently used in chelation therapy to remove Cd and other toxic metals and, when complexed with Fe(II) create species that can be used in vivo to trap and detect nitric oxide, an important biological signaling molecule. Dithiocarbamates have a high affinity for certain metals; but there is little quantitative information about the strength and nature of these interactions. To assess the effectiveness and side effects of chelation therapy and the use of dithiocarbamates in other applications, quantitative data is necessary to model competing interactions in complex biological systems where essential and toxic metals are present in varying concentrations. Isothermal titration calorimetry (ITC) has been used to obtain thermodynamic data (equilibrium constant, enthalpy and entropy of formation) for complexes of diethyldithiocarbamate with divalent transition metal ions. These results will be compared to other chelating agents and provide an important chemical basis for chelation therapy and the use of dithiocarbamates in a variety of biological studies.