Monatshefte für Chemie 115, 1319—1320 (1984)

Monatshefte für Chemie
Chemical Monthly

Ni(II)/*N*,*N*-Dimethylglycine Complex Equilibrium Study

Short Communication

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(Received 15 May 1984. Accepted 22 May 1984)

The complex formation of Ni(II) with *N*,*N*-dimethyl-glycine in water and in water-methanol has been studied by computer analysis of potentiometric data.

[Keywords: Complexes; N,N-Dimethylglycine; Nickel(II)]

Gleichgewichtsuntersuchungen der Komplexbildung von Ni(II) mit N,N-Dimethylglycin (Kurze Mitteilung)

Anhand der Computer-Analyse von potentiometrischen Daten wurden die Bildungsgleichgewichte von Nickel(II)-Komplexen mit *N*,*N*-Dimethylglycin in Wasser und Wasser—Methanol untersucht.

Recently, results of the investigation on nickel(II), copper(II), and zinc(II) complexes with the glycine derivatives have been presented in a number of papers[1–4]. The complex formation reactions of metals with ligands of this type provide with a useful model of metal—protein interaction. The introduction of methyl or phenyl substituents into a glycine molecule results in a significant change in the complex forming properties of the derivatives when compared to the unmodified ligand. In order to supplement the data presented in our previous papers[2–4], the results of a study on the Ni(II)/*N*,*N*-dimethylglycine (*DMG*) system in water and in water—methanol are given in this communication.

Stability constants of the complexes occuring in the system under study are presented in Table 1. It has been found that only NiL and NiL_2 complexes are formed in water. However, in water-methanol in addition to the occurrence of NiL and NiL_2 species the protonated compound NiHL has been established to exist. In the case of the latter compound, the $-NH_2$ group is blocked by proton, and thus only the $-COO^-$ group is involved in the coordination. For ML and ML_2 species it has been found earlier on the basis of NMR and IR studies[1] that both functional groups (amino and carbocylic) of *DMG* take part in complexation of the nickel(II) cation. Based on the analysis of the metal distribution among individual forms of the complex compounds (calculated by means of the HALTAFALL program[5]), it has been found that in the *DMG*/Ni system the complexes of the ML_x type begin to form at $pH \sim 5.5$ in water and at $pH \sim 4.8$ in a water – methanol solution (under the analysed conditions).

Table 1. *Overall stability constants of nickel(II) complexes with DMG*

Solvent	Reaction	$\log\beta$
H_2O	$M + L \rightleftharpoons ML$	4.71 (5)
	$M + 2L \rightleftharpoons ML_2$	8.47 (6)
CH_3OH/H_2O 50%/50% (*v*/*v*)	$M + L \rightleftharpoons ML$	4.98 (5)
	$M + 2L \rightleftharpoons ML_2$	9.17 (5)
	$M + L + H^+ \rightleftharpoons MHL$	10.82 (6)

The protonated complex NiHL occurs in acidic media and its concentration falls practically to zero at $pH \sim 7.5$.

The equilibrium constant (expressed as $\log K'$) of the NiHL compound formation ($M + HL \rightleftharpoons MHL$) amounts to 1,42, whereas its protonation constant is $\log K^H = 5.84$.

The species in the systems studied and the determination of their stability constants have been solved by computer analysis of the potentiometric titration data by means of the programs *SCOGS*[6] and *MINIQUAD*[7]. Details concerning experimental conditions and procedures have been given earlier[1–4].

References

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