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NOTES

Trivalent Rare Earth Complexes of Some Potential Antiinflammatory and Antipyretic Compounds

DEVASHISH BASAK*

Department of Chemistry
Allahabad University, Allahbad-211 002, India

Binary complexes of 2-aminobenzoic acid (2-ABA), 3-aminobenzoic acid (3-ABA) and 4-aminobenzoic acid (4-ABA) with La(III), Pr(III), Nd(III), Sm(III) and Gd(III) have been studied paper electrophoretically at different temperatures and a constant ionic strength. The stability constants of the complexes have been reported.

In the present investigation the formation of 1 : 3 metal-ligand complexes of La(III), Pr(III), Nd(III), Sm(III) and Gd(III) with 2-amino benzoic acid (2-ABA), 3-aminobenzoic acid (3-ABA) and 4-aminobenzoic acid (4-ABA) has been studied paper electrophoretically at different temperatures in aqueous media to have an insight into the behaviour of these biologoically active ligands towards the lanthanons (III). The stability constant values of the complexes have also been reported.

All the chemicals used were of A.R. grade. Metal perchlorates were prepared by the precipitation of metal carbonates with appropriate reagents. Precipitates were thoroughly washed with boiling water and treated with 10% perchloric acid. These were boiled on a waterbath, filtered and standardized[1]. The final concentrations of metal and ligand solutions were kept at 5.0×10^{-3} M and 1.0×10^{-2} M, respectively.

Systronics paper electrophoresis equipment No. 604 (India) and two types of pH indicator and accessories (leeds and Northrup, and Elico LI-110), having glass and calomel electrode assembly were employed after duly calibrating it with pH 4.0 and pH 9.2 buffer solutions. The calibration was checked after each set of experiments.

Electrophoretic observations were recorded as earlier reported methods[2] at temp. 25 ± 1°C, 35 ± 1°C and 45 ± 1°C, ionic strength being maintained at 0.1 M.

Mobility was calculated by earlier reported method[3]. Stability constants were found out with the help of pH vs. mobility curve[3] and dissociation constants of the ligands[4]. The values are presented in Table 1

All the pH vs. mobility curves show four plateaus for all the systems. The first plateau represents the region of uncomplexed metal ion while the subsequent plateaus indicate formation of the complexes. It is obvious that the complexation of the metal ions should be taking place with the ionised form of the ligand, whose concentration increases with the increase in pH.

*Present address: Amghat, Ghazipur-233 001, India.

TABLE 1 STABILITY CONSTANT VALUES OF COMPLEXES
Ionic Strength, μ = 0.1 M($HClO_4$)

Ligand	Temperature (± 1°C)	La(III)	Pr(III)	Nd(III)	Sm(III)	Gd(III)
2-ABA	25	4.58	4.88	4.98	4.78	4.68
	35	4.38	4.68	4.78	4.58	4.48
	45	4.18	4.48	4.58	4.38	4.28
3-ABA	25	5.39	5.69	5.79	5.60	5.49
	35	5.19	5.49	5.60	5.49	5.29
	45	4.99	5.29	5.39	5.19	5.09
4-ABA	25	5.02	5.32	5.42	5.22	5.12
	35	4.82	5.12	5.22	5.02	4.92
	45	4.62	4.92	5.02	4.82	4.72

After the first plateau, the decrease in mobility continues giving three more plateaus which are in quick succession. These plateaus very likely correspond to overwhelming formation of 1 : 1, 1 : 2 and 1 : 3 cationic complexes. No change in the mobility beyond the fourth plateau is evinced even at higher pH values, confirming that no further complexation takes place. Thus 1 : 3 binary complex of La(III), Pr(III), Nd(III), Sm(III) and Gd(III) with the ionised species of the ligands is the ultimate complex.

It is significan. to note that these studies give clear evidences of the formation of binary complexes of 1 : 3 composition.

A perusal of the Table 1 shows that the order of stability constant values of various lanthanides are as follows: Nd(III)>Pr(III)>Sm(III)>Gd(III)>La(III). Such stability order is not uncommon in the case of lanthanides[5, 6]. In view of the ligands, the order is found to be 3-ABA>4-ABA>2-ABA, the reason of which can be explained on the basis of the ability of deprotonation of the ligands[3].

It was observed that with increase in temperature the metal ligand stabiltiy constant decreases.

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