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Effect of non-aqueous solvents on stoichiometry and selectivity of complexes formed between 4'-nitrobenzo-15C5 with Fe^{3+}, Y^{3+}, Cd^{2+}, Sn^{4+}, Ce^{3+}, and Au^{3+} metal cations

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Conductance measurements of an electrolyte solution in the presence of a crown compound provide two valuable pieces of information. The first, is detection of complexation between the crown compound and the cation. Furthermore, the stability constant of the crown compound-cation complexes xcan be determined from the conductance data. Macrocycle design parameters, such as cavity size, the type and the number of donor atoms, the type and the number of proton-ionizable groups within and without the macrocycle cavity, churality's, the substituent groups, and the steric hindrance and also the solvent parameters can all be used to obtain the desired selectivities.

The complexation processes between Fe^{3+}, Y^{3+}, Cd^{2+}, Sn^{4+}, Ce^{3+} and Au^{3+} metal cations with macrocyclic ligand, 4'-nitrobenzo-15-crown-5 (4'NB15C5), were studied in acetonitrile(AN), methanole(MeOH) and nitromethane(NM) solvents at different temperatures using conductometric method. The conductance data show that the stoichiometry of the complexes formed between this macrocyclic and Cd^{2+}, Ce^{3+} and Au^{3+} cations is 1:1(ML), but in the case of Fe^{3+}, Y^{3+}, Ce^{3+} and Au^{3+} metal cations, 2:1(ML) complexes are formed in nitromethane solutions. The results show, that selectivity and 4'NB15C5 for the studied metal cations in methanol at 15°C is: $Sn^{4+} > Cd^{2+} > Y^{3+} > Fe^{3+}$, $Ce^{3+} > Au^{3+}$, but in the case of acetonitrile, the stability order was found to be: $Y^{3+} > Fe^{3+} > Cd^{2+}$. The values of stability constants of the 1:1[ML] complexes were determined from conductometric data using a GENPLOT computer program. The values of thermodynamic parameter (ΔH_c°, ΔS_c°) for formation of the complexes were obtained from temperature dependence of the stability constants, using the v'ant Hoff plot. The results show that the values of standard enthalpy (ΔH_c°) and standard entropy (ΔS_c°) change with the nature of the non aqueous solvents.

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