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Formation of Yttrium(III) Complexes with Salicylic Acid Derivatives in Aqueous Solution

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Abstract: Complexes of yttrium(III) formed with 5-sulphosalicylic acid, 5-SSA (H_3L), and 5-nitrosalicylic acid, 5-NSA (H_2L), were investigated in 0.1 mol.dm^{-3} sodium perchlorate ionic medium at 25.0 \pm 0.1 ° C potentiometrically for various molar ratios of Y(III) to these salicylic acid, SA (H_2L), derivatives. Y(III) forms YL and YL_2^{3-} type complexes with 5-SSA that have rather high stabilities (log β_1 = 7.91 \pm 0.01 and log β_2 = 14.56 \pm 0.06). In the Y(III):5-NSA system, YL^+ and YL_2^- type complexes appear with high stabilities (log β_1 = 7.39 \pm 0.02 and log β_2 = 13.50 \pm 0.07). Y(III):5-SSA and Y(III):5-NSA complexes exist over a very wide pH range (pH 2.50-11.0) and these SA derivatives are coordinated from salicylate sites (COO^- , O). The stabilities of Y(III) complexes formed with 5-NSA and 5-SSA are higher than its SA and 5-hydroxysalicylic acid, 5-HSA (H_3L), complexes due to the existences of electron withdrawing groups at the fifth position. The formation constants of Y(III) complexes of SA and SA derivatives are lower than those of their Sc(III) complexes as a result of the smaller ionic potential of Y (III). Due to the higher charge on yttrium Y(III) complexes of SA, 5-NSA and 5-SSA are more stable than Ca(II):SA complex. This result may be utilized for in vitro and in vivo studies, since the ionic radia of Ca (II) and Y(III) are roughly equal.

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