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## Kinetics and mechanism of periodate oxidation of two ternary nitrilotriacetate chromium (III) complexes involving histidine and aspartate co-ligands

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The oxidation of  $[\text{Cr}^{\text{III}}(\text{HNTA})(\text{Hist})(\text{H}_2\text{O})]^-$  and  $[\text{Cr}^{\text{III}}(\text{HNTA})(\text{Asp})(\text{H}_2\text{O})]^-$  (NTA=nitrilotriacetate, Hist=L-histidine and Asp=DL-aspartate) by periodate in aqueous medium has been studied spectrophotometrically between 15.0 and 35.0°C under pseudo-first-order conditions,  $[\text{IO}_4^-]$  [complex]. The rate increases over the pH range 3.40-4.45 in both cases, but the two complexes give different rate laws, in aqueous solutions,  $[\text{Cr}^{\text{III}}(\text{HNTA})(\text{Hist})(\text{H}_2\text{O})]^-$  is oxidized by  $\text{IO}_4^-$  according to the following rate law:  $d[\text{Cr}^{\text{VI}}]/dt = (k_1K_2 + k_2K_3K_1/[\text{H}^+])[\text{IO}_4^-][\text{Cr}^{\text{III}}\text{T}]/\{1 + (K_1/[\text{H}^+]) + (K_2 + K_1K_3/[\text{H}^+])[\text{IO}_4^-]\}$ . The other case is  $[\text{Cr}^{\text{III}}(\text{HNTA})(\text{Asp})(\text{H}_2\text{O})]^-$  the derived rate law is given by equation:  $\text{Rate} = k_1K_2[\text{Cr}^{\text{III}}\text{T}][\text{I}^{\text{VII}}\text{T}]/\{1 + ([\text{H}^+]/K_1) + K_2[\text{I}^{\text{VII}}\text{T}]\}$ . Electron transfer, outer-sphere and inner-sphere mechanisms have been discussed. The nature, properties, chemical behavior and different species in aqueous solutions of periodate have been reported. A literature survey on the oxidation of organic and inorganic compound in aqueous solutions and in aqueous organic solvent was reported. The nature of  $\alpha$ -amino acids and their metal complexes have been briefly discussed, it is clear that  $[\text{Cr}^{\text{III}}(\text{NTA})(\text{Asp})(\text{OH})]_2^-$  may be the reactive species, an inner-sphere process may be still accommodating through replacement of coordinated  $\text{H}_2\text{O}$  in two species by  $\text{IO}_4^-$ . The rate of reaction increases with the increasing of complex concentration and ionic strength. The thermodynamic activation parameters were calculated, and we propose that electron transfer proceeds through an inner-sphere mechanism, via coordination of  $\text{IO}_4^-$  to chromium (III). A common mechanism for the oxidation of some to chromium(III) complexes by periodate is proposed by an excellent isokinetic relationship between and values for these reactions.

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