



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI  
SHORT ABSTRACT OF THESIS

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**SHORT ABSTRACT**

Peroxyxynitrite is the product of the diffusion-controlled reaction of nitric oxide and superoxide radicals. Peroxyxynitrite, having short-lived period less than 10 ms with a  $pK_a$  of 6.8, is a good oxidant and nucleophile. Metal peroxyxynitrites are formed mainly in two pathways:- i) Metal nitrosyl complexes can react with oxidant like oxygen, superoxide or peroxide to form the corresponding metal peroxyxynitrite and in another way ii) metal dioxygen species like, metal superoxo and metal peroxo complex may react with nitric oxide to form metal peroxyxynitrite. In literature, there are many more reports on the formation of iron and copper peroxyxynitrite intermediate but reports on cobalt peroxyxynitrite are few and far between. With this direction the present thesis is originated from our interest to study the formation of cobalt peroxyxynitrite intermediates and to investigate the decomposition pathways by phenol ring nitration resembling the nitration of tyrosine in biological system. In very first chapter we have discussed the various pathways of formation of the metal peroxyxynitrite intermediate. The second chapter describes the reaction of a Co(II) complex with NO and the formation of a Co-nitrite complex *via* a thermally unstable Co-dinitrosyl intermediate. As we could not isolate the Co-dinitrosyl species, further proceed towards the formation of peroxyxynitrite was excluded. In literature we found some nitrosyl complexes of cobalt salen are much more stable. In this aspect the third chapter discusses the reactivity of a nitrosyl complex of cobalt with salen ligand. The complex was found to react with  $KO_2$  to result in the formation of a Co-nitrate complex *via* a putative Co-(ONOO<sup>-</sup>) intermediate. In addition, the bound NO group of the nitrosyl complex was transferred to a cobalt porphyrinate. As we got another stable nitrosyl complex of cobalt porphyrin, the fourth chapter deals with the reaction of a nitrosyl complex of cobalt porphyrinate with  $H_2O_2$  to result in the cobalt nitrite complex through a putative formation of Co-(ONOO<sup>-</sup>) intermediate. The alternative pathway of formation of cobalt peroxyxynitrite has been described in the last chapter of this thesis. This chapter describes the formation of a Co-(ONOO<sup>-</sup>) intermediate in the reaction of a cobalt-peroxo complex with NO leading to the formation of a cobalt-nitrate complex. The direct spectroscopic evidence of cobalt peroxyxynitrite intermediate could not get due to its unstable nature. Only chemical evidence proved the formation of the peroxyxynitrite intermediate. In future to get some spectroscopic evidences we have to design some more effective ligand framework or the reaction condition we have to choose more precisely to stabilize the readily form intermediate.