

SUBSTITUTION OF PYRIDINE
INTO COBALT (III) COMPLEXES

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ABSTRACT

An investigation has been carried out of the reactions of some cobalt (III) complexes with organic ligands, with emphasis on the rates and mechanisms of reaction.

A literature review is given of the development of the theory and practical study of reaction rates and mechanisms, leading on to a discussion of reaction rates and mechanisms in solution, and the reactions of transition metal complexes in particular.

Nucleophilic substitutions are discussed, first at carbon atoms and then at transition metals. It is seen that very little work has previously been done on the rates and mechanisms of substitution at transition metals by uncharged nucleophiles, other than solvation studies.

Solvation studies are limited in scope by the fixed concentration and great excess of one reactant, the solvent, and so it seems desirable to investigate substitutions by uncharged nucleophiles other than the solvent.

The substitution of pyridine into trans dichlorobis(ethylene-diamine) cobalt is investigated spectrophotometrically in methanol solution. Before this is done, a spectrophotometric investigation

of some cobalt (III) complexes is made, and the results discussed in relation to the investigations of other workers on similar compounds. A number of new assignments are made for infrared, visible, and ultraviolet spectra.

The substitution of pyridine into the cobalt complex is shown to be methoxide catalysed, either directly or via a cobalt (II) species. Unbuffered pyridine produces enough methoxide from the solvent to enable reaction to take place, but the addition of acid suppresses this. Reactions other than substitution take place, including the reduction of some cobalt (III) to cobalt (II).

The reduction of cobalt (III) to cobalt (II) by pyridine is investigated and shown not to be photochemical.

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