# MIXED HALOCOBALTATES(II) -- A PREPARATIVE AND STRUCTURAL STUDY

BY

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## CERTIFICATE

This is to certify that the thesis entitled 'Mixed Halocobaltates(II)-- A Preparative and Structural Study' being submitted by Mr. Akhilesh Saxena to the Indian Institute of Technology, Delhi, for the award of the degree of Doctor of Philosophy in Chemistry is a record of bonafide research work carried out by him. The results reported in this thesis have not been submitted to any other university or institute for the award of any degree or diploma.

Mr. Saxena has worked under my guidance and supervision and has fulfilled the requirements for the submission of this thesis.

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## ABSTRACT

This work reports the isolation and characterization of some mixed halocobaltates(II) (halo = chloro, bromo, iodo). Electronic spectral (visible and near i.r.), far i.r. (400-100 $cm^{-1}$), magnetic moment and conductance studies have been carried out to get an insight into the structural aspects of these complexes. While the mixed tetrahalocobaltates(II) have been found, as expected, to be tetrahedral, the mixed tri-and the pentahalocobaltates(II) have also revealed a tetrahedral environment around Co(II). Pentahalocobaltates(II) have been formulated as double salts containing a tetrahalocobaltate(II) species and for trihalocobaltates(II) a linear chain structure with bridging halogens has been favoured over a possible dimeric unit structure. 10Dq, B' and $\lambda'$ values have been calculated. Assignment of the bands in the far i.r. region has been done. An attempt has been made to explain the abnormally high and abnormally low magnetic moment values found (at room temperature) for pentahalocobaltates (II) and trihalocobaltates(II), respectively, in view of their containing a tetrahedrally surrounded Co(II). Molar conductance values measured at a fixed concentration in acetonitrile to characterize these complexes have been shown to lead to deceptive results. For trihalocobaltates(II), Debye-Hückel-Onsager equation shows them to be, at least in solution, (1:1) electrolytes. Unit cell dimensions for some of the complexes have been found out from X-ray powder diffraction patterns.

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