

**STUDIES ON MIXED AND SUBSTITUTED TETRAHALO-  
COBALTATES (II) AND NICKELATES (II)**

**BY**

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CERTIFICATE

This is to certify that thesis entitled "Studies on Mixed and Substituted Tetrahalocobaltates(II) and Nickelates(II)", being submitted by Mr. Radheyshyam Prasad 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. Mr. Radheyshyam Prasad has worked under my guidance and supervision and has fulfilled the requirements for the submission of his thesis.

The results contained in this thesis have not been submitted, in part or full, to any other University or Institute for the award of any degree or diploma.



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## ABSTRACT

The present investigation reports the isolation and characterization of

- (i) mixed tetrahalonickelates(II), (halo = chloro or bromo),
- (ii) substituted mixed tetrahalocobaltates(II) and nickelates(II), (halo = chloro, bromo or iodo)
- and(iii) diisothiocyanatodihalocobaltates(II) and nickelates(II), (halo = chloro, bromo or iodo)

by conductance, electronic (visible and near i.r.), i.r. and far i.r. spectral studies and magnetic susceptibility measurements.

Molar conductance measured at a fixed concentration in nitromethane suggests the electrolyte type as manifest in the molecular formula of the respective complexes. The electronic spectra have been interpreted on the basis of  $T_d$  symmetry in case of mixed tetrahalonickelates(II), e.g.  $(NiCl_2Br_2)^{2-}$ ,  $C_{2v}$  symmetry in case of diisothiocyanatodihalocobaltates(II) and  $C_{3v}$  symmetry in case of substituted mixed tetrahalocobaltates(II) and nickelates(II). For some of the complexes ligand field parameters  $10 Dq$ ,  $B'$  and  $\beta$  and for only a few the crystal field splitting parameter  $D_T$  have been calculated. The magnetic moments generally fall within the range expected for a tetrahedral and pseudotetrahedral Co(II) and Ni(II) complexes. Low temperature magnetic susceptibility data (reported only for two of the complexes) do not indicate any significant magnetic interaction. Bands in the i.r. (in case of thiocyanato complexes) and far i.r. regions have been assigned.

Unit cell dimensions of one of the compounds  $[(C_2H_5)_4N][Ni(PPh_3)Cl_2Br]$  were determined by single crystal Weissenberg photographs.

Other few complexes with the formulation  $[(C_2H_5)_4N][M(PPh_3)_2X_2Y]$  (where M = Co or Ni; X and Y = Cl, Br or I) were found to be isomorphous to the above compound by x-ray powder diffraction study.

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