Very few number of scientists reported the complex compound of ephedrine with metals with special reference to transition metals. Morris & Stejar prepared violet complex of dl ephedrine with basic copper sulfate. They used this complex in the pharmaceutical industry for the identification of ephedrine. The kinetics of reactions of bis (-) ephedrine Cu(II) chelate with halogen containing compounds have been studied by Jaroslan, Smola and Nameck.

Amano et al. studied the copper chelate of ephedrine in which the H atom of the alcoholic OH group of ephedrine molecule is replaced by Cu ion in the chelate, with a four coordinated square planar ring. It forms a trimer by means of 6H bonds, with a Cu-Cu distance 4.07Å. The intensities of the Weissenberg photographs were established visually and the preliminary scale and temperature factor detected by refinement of Wilson's method.

Amano et al. again prepared l-ephedrine copper (II) chelates obtained from several different solvents. Three different single crystals of l-ephedrine Cu (II) chelate were obtained by recrystallization from cyclohexane, mesitylene and hexane. The crystal recrystallized from cyclohexane has the composition \( (C_{10}H_{14}O_N)_{2}Cu \) \( 1/3 C_{6}H_{12} \) and its space group is \( P 1 \). The lattice constants are a 11.73 and C 14.94Å.
The recrystallized crystal from mesitylene has the composition \((C_{10}H_{14}CN)_2Cu \frac{2}{3}C_9H_{12}\), and its space group is \(I\overline{6} 22-3\) or \(I\overline{6} 22-D_{2d}^3\). The lattice constants are \(a 11.64\) and \(c 95.11\) A. The crystal recrystallized from hexane has the composition \((C_{10}H_{14}CN)_2Cu \frac{1}{6}C_6H_{14}\). The space group is \(I\overline{2} 1 2 1 2 1 - D_{3d}^2\) and the lattice constants are \(a 16.37\), \(b 19.27\) and \(c 42.65\) A.

The presence of \(OH\) groups, \(C-N\) and \(N-CH_3\) groups in the compound makes it a potential coordinating ligand. As regards the nature of complexes formed, they may be formed either by the replacement of hydrogen by the metal or direct coordination with ligand.

The work described in the following pages deals with the interaction of \(V^{2+}\), \(Cr^{3+}\), \(Mn^{2+}\), \(Fe^{3+}\), \(Co^{2+}\), \(Ni^{2+}\) halides and sulfate of \(UO_2^{2+}\) with ephedrine.
EXPERIMENTAL

Chlorides of vanadyl, chromium, manganese, iron, cobalt, nickel and sulfate of uranyl - (All B. D. H.). Ephedrine was used without further crystallization.

Conductometric titrations were performed with a Philips conductivity bridge (MR 9500), using a dip type cell (cell constant 0.84). Potentiometric titrations were done on a Pye type potentiometer using aqueous solutions.

The i.r. spectra of complexes and ligand were recorded from 2.5 to 50 u with a Perkin Elmer Infra red spectrophotometer type 621 using the nujol mull.

Microanalysis were done by Microanalytical Division, Central Drug and Research Institute, Lucknow, U. P. India.
Vo$^{+2}$, Cr$^{+3}$, Mn$^{+2}$, Fe$^{+3}$, Co$^{+2}$, Ni$^{+2}$ and UO$_2^+$ form 1:2 complexes. The complexes are highly soluble in water and in organic solvents. Chemical analyses indicated complexes of the type $M$(Ephedrine)$_2$ where $M$ stands for metals Vo$^{+2}$, Mn$^{+2}$, Co$^{+2}$, Ni$^{+2}$ and UO$_2^+$ and $M$(Ephedrine)$_2$Cl for Cr$^{+3}$ and Fe$^{+3}$. The interaction is achieved through the replacement of hydrogen by the metal ion. The same ratio (metal:ligand) was revealed by conductometric and potentiometric titrations.

The ephedrine exhibits secondary alcoholic (CH), C=N, NH, N-CH$_3$ and C-CH$_3$ groups along with C=C bond. The i.r. studies were carried out to ascertain coordination site in the complexes.

In the i.r. spectra of ephedrine, single NH absorption occurs near 3320 cm$^{-1}$; a band at 1565 cm$^{-1}$ (medium sharp) may be assigned to skeletal C=C. Two very weak bands at 1375 cm$^{-1}$ and 1455 may be assigned for C-CH$_3$ and N-CH$_3$ groups respectively. The stretching vibration at 1245 may be assigned to C=O. The most important group susceptible for coordination is the secondary alcoholic group. A peak of medium intensity appears at 1120 cm$^{-1}$ which may be cited for the OH group.

After complexation with metals the peak of CH group is disappeared as reported. There is no change in other bands.
related to other groups. Therefore this may be safely assumed that the hydrogen of alcoholic group is replaced through metal ion.
REFERENCES


6. Ref. 5 p. 65

7. Ref. 5 p. 71

8. Ref. 5 p. 258

9. Ref. 5 p. 249

10. Ref. 5 p. 286

11. Ref. 4