Range rate errors are proportional to the time derivative of TEC. The angular refraction, errors to a first approximation, can be related to the TEC. The TEC measurements are therefore used for tracking errors.

For the Indian zone, a numerical model to represent the total electron content for different seasons and for different sunspot epochs was constructed from the TEC data obtained from the Faraday rotation measurements from the orbiting satellite Explorer BE-B (1000 km polar orbit) and reported by Klobuchar, et al.\(^1\). This would give corrections for satellites at altitudes of 1000 km or greater, since the contributions from above 1000 km in the total electron content is not much. Faraday rotation measurements at a chain of stations in India during the ATS-6 phase II (October 1975 to July 1976) provided TEC data with very good time resolution and a numerical model for low latitude TEC was constructed by Sethia et al.\(^2\).

Fig. 1. Integrated electron content over Thumba using bottomside ionosonde data.

However, for low orbiting satellites like the satellite for earth observation (SEO) these models would not be of much use. One requires information about the total electron content for lower orbiting heights and for this, an attempt has been made to integrate the electron density profiles derived from ionograms obtained at Thumba (dip 0-6 deg. S). The ionization profiles above the height of maximum ionization (h_m F_0) are extrapolated by assuming an exponential decrease. Mean N–H profile on quiet days of the three representative months of January, April and July have been obtained both for a low sunspot year 1965 (mean R_s value of 15) and for a medium sunspot year 1967 (mean R_s value of 96). Integrations up to 300 km, 400 km and 500 km have been performed and the daily variations of the total electron content are shown in Fig. 1. The values for the year 1965 are half the values plotted. These values can be used to evaluate the time delay and hence the range error introduced by the ionization according to equations 1 a and 1 b for equatorial latitudes.

Thanks are due to Mrs. S. Desai for computational help.


SYNTHESES OF TRICHOCOLEIN

Recently a new aromatic ester, Trichocolein, has been isolated from the liverwort, *Trichocolea tomertella*, by Asakawa et al.\(^3\). They have assigned the structure as prenyl veratrate (I), based on spectroscopic studies. We now report the synthesis of I starting from vanillin. Vanillin on methylation with dimethyl sulphate, potassium carbonate and acetone for 6 hours (reflux) gave a product, which on hydrolysis with alcoholic potash for 30 min (reflux) gave veratraldehyde. The latter on oxidation with potassium permanganate afforded veratic acid. Veratic acid on esterification with prenyl bromide, potassium carbonate and acetone for two hours gave prenyl veratrate (I).

![Chemical Structure of Trichocolein](image)

B.p. 180° (Found C, 66.8; H, 6.9: C_{44}H_{48}O_{4} requires C, 67.2; H, 7.2)

UV \(\lambda_{max}\) 217, 259 and 290 nm,

IR \(\nu_{max}\) 1715, 1596, 1498, 1270 and 760 cm\(^{-1}\).

NMR (CDCl\(_3\) : \(\delta\) 1.75 (s, 6H, 2CH\(_3\)), 3.85, 3.95 (2s, 6H, 2OCH\(_3\)), 4.8-4.95 [d, J = 8Hz, 2H, –CH\(_2\)-CH = C(CH\(_3\))\(_2\)]), 5.4-5.48 (m, 1H, –O-CH\(_2\)-CH = C\(_{4}\)), 7.05 (d, 1H, J = 9Hz, C\(_5\)-H) 7.85 (d, 2H, J = 9Hz, C\(_4\), 6-H).
The above data agreed in all respects with the reported data for (I) in literature. The direct comparison with the natural sample could not be made due to the non-availability of the sample.

Department of Chemistry, University of Delhi, Delhi 110 007, June 22, 1979.


STEREOCHEMICAL FEATURES OF SOME Ni(II) COMPLEXES OF 2-AMINO-PYRIDINE: THIOSEMICARBAZIDE AND ITS SUBSTITUTED THIOSEMICARBAZONE

In the present work, Ni(II)-complexes of 2-amino-pyridine : thiosemicarbazide (APT) and its substituted thiosemicarbazone, viz., 1-benzilidene, 4-(a-pyridyl) thiosemicarbazone (BPT) and 1-ortho hydroxy benzilidene, 4-(a-pyridyl) thio-semanticarbazone (HO–BPT) have been prepared and characterized. Various ligand field parameters have been evaluated using Konig's approach. The ligands were prepared by reported methods and recrystallised from ethanol.

\[ [\text{Ni} (\text{APT})_2 \text{Cl}_2] : \text{Ni(II) chloride hexa hydrate (10 m mole) in 40 ml ethanol was mixed with the ligand-APT (20 m mole) in the same solvent. The reaction mixture was refluxed for ~ 2 hrs at low temperature and then set aside in a petridish, to evaporate at room temperature, for several days. The light brown crystals obtained were thoroughly rinsed with ethanol-acetone mixture and then dried under vacuum at room temperature. Yield ~ 65% [Found: Ni, 12-19; C, 30-22; H, 3-52; N, 24-47; S, 13-28; Cl, 15-51. Caled. For [Ni(C_6H_5N_2S)_2Cl_2] Ni, 12-66; C, 30-90; H, 3-43; N, 24-03; S, 13-73; Cl, 15-23%].] \]

\[ [\text{Ni}(\text{APT})_2 (\text{CN})_2] \text{ and } [\text{Ni}(\text{APT})_2 (\text{NH}_3)_2] : \text{The above procedure was repeated followed by the addition of KCN and NH}_3 \text{ solutions to obtain greyish white and greyish brown substances respectively and the crystals dried in vacuo.} \]

\[ [\text{Ni}(\text{APT})_2 (\text{OH})_2] : \text{Ethanolic solution of Ni(II) nitrate hexa hydrate (10 m mole) in the same solvent was mixed with the dark bluish green solution was obtained (pH ~ 4-5), from which brown coloured chelate was obtained by addingaq. NaOH upto pH 6-5 and dried completely under vacuum.} \]

\[ [\text{Ni} (\text{BPT})_3] \text{Cl}_2] : \text{On mixing acetic solution of Ni(II) chloride hexa hydrate (10 m mole) and ligand BPT (20 m mole) a yellowish green coloured solution was obtained (pH ~ 4-5), which on refluxing (~ 2 hrs) at low temp. (60-70°C) and successive concentration under vacuum afforded brown coloured crystals of the complex.} \]

\[ [\text{Ni} (\text{HO–BPT}) \text{Cl}_2, \text{H}_2\text{O}] : \text{A yellowish green coloured reaction mixture was obtained when acetonitrile nickel(II) chloride hexa hydrate (10 m mole) was mixed with the ligand HO–BPT (10 m mole) in the same solvent. Shining green coloured complex was obtained on refluxing and concentrating at low temperature (60-70°C).} \]

All compounds gave satisfactory C, H and N analyses. The molar conductance measurements of 10^{-3} M solutions of the complexes in DMF reveal that complex [Ni(BPT)_3] Cl_2 is univalent electrolyte and the other complexes are non-electrolytes. The magnetic moment values lie in the range 2.91-3.50 BM which are well within the range (2.8-3.2 BM) expected for octahedral geometry.

The electronic spectra of the complexes were recorded as reported earlier. The calculated values of the transitions \( \pi_1, \pi_2 \) and \( \pi_3 \) and the value of the Racah parameter have been evaluated according to the reported methods. The inner configurational transition (\( \beta \)) and LFSE depend significantly on the method adopted for their calculation (Table I). The values of \( \beta \) of these complexes are between 0-5 and 1-0, clearly indicate the partial covalent character of the bond concerned. It has also been concluded that the best results may be obtained by the method which results from fitting the some of second and third bands.

In the infrared region, the ligand display characteristic absorption bands attributable to (NH) stretching at 3250-3175 cm\(^{-1}\). The (NH) bending modes in the region 1560 cm\(^{-1}\) are obscured by modes associated with pyridine ring system of the ligand. Secondly, no characteristic changes were observed in the frequencies at 1640 and 1610 cm\(^{-1}\) in APT-complexes (attributed to \( \delta \) (NH) and amide band) and this implies non-participation of hydrazide nitrogen in coordination. In the complexes of BPT and HO–BPT, bands due to imine nitrogen \( \nu(C=\text{N}) \) are shifted towards lower frequencies and sharp peaks are generally reduced to shoulders, suggesting involvement of imino-nitrogen in coordination. It has been observed that the symmetric and antisymmetric \( \nu(C=\text{C}) + \nu(C=\text{N}) \) vibrations of pyridine ring either weaken or in some cases a slight upward shift (10-30 cm\(^{-1}\)) occur on coordination, suggesting metal-pyridine bonding in complexes. The bands at 1333-1308 and 1136 cm\(^{-1}\) (APT), 1266 and 1156 cm\(^{-1}\) (BPT) and 1274 and 1190 cm\(^{-1}\) (HO–BPT) are shifted to higher wave numbers while the bands 760 cm\(^{-1}\) (APT), 806 cm\(^{-1}\) (BPT) and 790 cm\(^{-1}\) (HO–BPT) are lowered in frequency and sometimes weakened in intensity having splitted bands, upon complexation. This considerable shift on complexation is attributed to coordination of thio keto sulphur. The disappearance of the stretching