CHAPTER VI

COMPLEXES OF NICKEL(II) KETOXIMATES

WITH TIN(IV) CHLORIDE
INTRODUCTION

Aldoximes and ketoximes have been extensively used in analytical chemistry for the estimation of a number of metals, especially for copper and nickel. The data accumulated on the transition metal complexes reflect the attention to the structural aspects of these complexes during the last few years. Recently, Voiculescu et al. have published a few papers on binuclear complexes of aldoximates. Biradar et al. have published binuclear complexes of aldoximates, and bimetallic complexes of cobalt(II) Schiff bases with tin(IV) chloride.

However, there is not much information on binuclear complex of ketoximes. These observations led the author to study the reaction of tin(IV) chloride with nickel(II) ketoximates.

The ketoximes used are shown below:

\[
\begin{array}{c}
\text{R} \\
\text{\includegraphics[width=2cm]{ketoxime_structure.png}} \\
\text{I} & \text{H} \\
\text{II} & 3-\text{CH}_3 \\
\text{III} & 4-\text{OH}_3 \\
\text{IV} & 5-\text{CH}_3 \\
\text{V} & 3-\text{Cl}
\end{array}
\]
Ketoximes and nickel(II) ketoximates were prepared according to the methods described in Chapter II, Sect. II, B.1 and 3.

**Preparation of tin(IV) bimetal complexes**

Nickel(II) ketoximate was dissolved in either benzene or chloroform and treated with tin(IV) chloride in the same solvent in 1:1 molar proportions with vigorous shaking and left to stand for several hours at room temperature with occasional shaking. The precipitated bimetal complex was filtered, washed with benzene and dried in vacuum over fused calcium chloride. The dry complex was powdered and extracted with benzene in soxhlet extractor for about 5 to 6 hours and then dried in vacuum.

**Elemental analysis**

Analysis of the complexes were made according to the methods in Chapter II, Sect. V. The results of the elemental analysis are shown in Table VI-2.
### Table VI-1

Elemental analysis of nickel(II) ketoximates and their electronic spectral band (in cm⁻¹)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Complex</th>
<th>Empirical formulae</th>
<th>% Ni</th>
<th>% N</th>
<th>Observed band maxima in chloroform (in cm⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ni(II)(2-OH-acetophenone-oxime)₂</td>
<td>Ni(8H₂O₂N)₂</td>
<td>16.30</td>
<td>7.85</td>
<td>16,810</td>
</tr>
<tr>
<td>2</td>
<td>Ni(II)(3-CH₃-2-OH-acetophenone-oxime)₂</td>
<td>Ni(9H₁O₂N)₂</td>
<td>15.13</td>
<td>7.30</td>
<td>16,810</td>
</tr>
<tr>
<td>3</td>
<td>Ni(II)(4-CH₃-2-OH-acetophenone-oxime)₂</td>
<td>Ni(9H₁O₂N)₂</td>
<td>15.31</td>
<td>7.22</td>
<td>16,810</td>
</tr>
<tr>
<td>4</td>
<td>Ni(II)(5-CH₃-2-OH-acetophenone-oxime)₂</td>
<td>Ni(9H₁O₂N)₂</td>
<td>15.28</td>
<td>7.18</td>
<td>16,670</td>
</tr>
<tr>
<td>5</td>
<td>Ni(II)(5-Cl-2-OH-acetophenone-oxime)₂</td>
<td>Ni(8H₂7O₂NCl)₂</td>
<td>13.82</td>
<td>6.45</td>
<td>16,810</td>
</tr>
</tbody>
</table>

**Note**: All the complexes are diamagnetic in nature. Values in the parentheses are the calculated values.
Table VI-2
Elemental analysis of nickel(II) ketoxime complexes with tin(IV) chloride and their magnetic moments (in B.M.) at room temperature

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Complex</th>
<th>Empirical formulae</th>
<th>% Sn</th>
<th>% Ni</th>
<th>% C</th>
<th>% N</th>
<th>% Cl</th>
<th>(\mu_{\text{eff}}) (B.M.) at room temp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ni(2-OH-acetophenone oxime)(_2)SnCl(_4)</td>
<td>Ni((C_6H_5O_2N)_2)SnCl(_4)</td>
<td>19.15</td>
<td>9.28</td>
<td>29.90</td>
<td>4.40</td>
<td>23.00</td>
<td>2.98</td>
</tr>
<tr>
<td>2</td>
<td>Ni(3-OH(_2)-2-OH-acetophenone-oxime)(_2)SnCl(_4)</td>
<td>Ni((C_9H_{10}O_2N)_2)SnCl(_4)</td>
<td>18.00</td>
<td>9.20</td>
<td>34.06</td>
<td>4.50</td>
<td>21.40</td>
<td>3.12</td>
</tr>
<tr>
<td>3</td>
<td>Ni(4-OH(_2)-2-OH-acetophenone-oxime)(_2)SnCl(_4)</td>
<td>Ni((C_9H_{10}O_2N)_2)SnCl(_4)</td>
<td>17.95</td>
<td>9.15</td>
<td>34.00</td>
<td>4.40</td>
<td>22.05</td>
<td>3.02</td>
</tr>
<tr>
<td>4</td>
<td>Ni(5-OH(_2)-2-OH-acetophenone-oxime)(_2)SnCl(_4)</td>
<td>Ni((C_9H_{10}O_2N)_2)SnCl(_4)</td>
<td>18.05</td>
<td>9.20</td>
<td>33.75</td>
<td>4.27</td>
<td>22.20</td>
<td>2.70</td>
</tr>
<tr>
<td>5</td>
<td>Ni(5-Cl(_2)-2-OH-acetophenone-oxime)(_2)SnCl(_4)</td>
<td>Ni((C_9H_{10}O_2NCl)_2)SnCl(_4)</td>
<td>17.75</td>
<td>8.75</td>
<td>27.27</td>
<td>3.87</td>
<td>21.05</td>
<td>3.03</td>
</tr>
</tbody>
</table>

Values in the parentheses are the calculated values.
Physicochemical measurements were made according to Chapter II, Sect. IV.

**RESULTS AND DISCUSSION**

The complexes are light-blue to green in colour, insoluble in common organic solvents and soluble to a limited extent in DMF and pyridine. This insolubility of the complexes in the common organic solvents has made out efforts to determine molecular weights frivolous.

Non-evolution of the hydrogen chloride gas during the course of the reaction pin points the probability of adduct formation. Further the elemental analysis shown in Table VI-2, suggests that these bimetal complexes have 1:1 stoichiometry viz. Ni(Ketoxime)$_2$SnCl$_4$.

**Molar conductance**

The molar conductance values of the complexes in DMF at the concentration $\sim 10^{-3}$ M fall in the range of 0-5 ohm$^{-1}$ cm$^2$ mole$^{-1}$ suggesting that all these complexes show non-electrolytic behaviour in DMF.

**Magnetic properties**

All the nickel(II) ketoximates under present
discussion are diamagnetic (Table VI-1) indicating that nickel(II) has square planar configuration in these complexes. The complexes formed as a result of reaction tin(IV) chloride with nickel(II) ketoximates whereas show paramagnetic behaviour. The magnetic moments determined at room temperature are shown in Table VI-2. They are in the range of 2.70 to 3.12 B.M. These evidences favour that nickel(II) has undergone a change in configuration as a result of reaction with tin(IV) chloride. This conclusion is further substantiated with the help of electronic spectra of these bimetal complexes.

**Electronic spectra.**

The band maxima of the nickel(II) ketoximates are listed in Table VI-1 (Figs. VI.1). All these complexes exhibit a medium intensity broad band around 16,670 cm⁻¹. It is known that the square planar nickel(II) complexes display a medium intensity broad band in the 22,200-16,670 cm⁻¹ region.⁵,⁶ The other bands also appear in the visible region because of the green or blue colours of the complexes. However, we have taken the medium intensity broad band around 600 nm as the characteristic band of the square planar nickel(II) complexes. The bimetal complexes show three bands in the region 400-1000 nm, and these are
assigned to various d-d transitions (Table VI-3) (Figs. VI.2). These bands are reported to shift to the higher wavelengths in the weaker fields.  

Of these three bands, the first band around 20,830 cm\(^{-1}\) appears as an inflexion forming tail end of the high intensity charge transfer band and this is assigned to the \(3A_2\rightarrow 3T_1g\) (P). The middle band appearing in the region 17,860-16,950 cm\(^{-1}\) is due to the \(3A_2\rightarrow 3T_{1g}\) (P) and this band does not show any splitting. The last band centred around 11,760 cm\(^{-1}\) may be considered as due to the \(3A_2\rightarrow 3T_{2g}\). These assignments closely agree with the previous ones.\(^5,6,8-10\) These transitions may be calculated with the help of Bal housen\(^11\) and Jorgensen\(^12\) generalized relations and these are shown in Table VI-3. They agree well with the observed values suggesting that the change in certainly to the octahedral configuration. It is obvious that for an octahedral Ni(II) complexes the ratio \(\frac{3A_2\rightarrow 3T_{1g}(P)}{3A_2\rightarrow 3T_{2g}}\) is 1.8. But the values in the range of 1.6 - 1.8 have been reported for a number of octahedral nickel(II) complexes, with strong, as well as weak field ligands.\(^13\) The observed values for these complexes fall in the range of 1.75-1.77 supporting the conclusions adduced with the help of magnetic data. All these observations suggest that nickel(II) has attained an octahedral
### Table VI-3

Electronic spectral data (in cm\(^{-1}\)) of the nickel(II) ketoximate complexes with tin(IV) chloride in DMF

<table>
<thead>
<tr>
<th>S. No.</th>
<th>(3A_{2g} \rightarrow 3 \Pi_{2g}) (P) (found)</th>
<th>(3A_{2g} \rightarrow 3 \Pi_{1g}) (P) (found)</th>
<th>D</th>
<th>(3A_{2g} \rightarrow 3 \Pi_{1g}) (P) (Calcd)</th>
<th>(3A_{2g} \rightarrow 3 \Pi_{2g}) (P) (Calcd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11,760</td>
<td>16,950</td>
<td>20,830</td>
<td>1176</td>
<td>1.77</td>
</tr>
<tr>
<td>2</td>
<td>11,760</td>
<td>16,950</td>
<td>20,830</td>
<td>1176</td>
<td>1.77</td>
</tr>
<tr>
<td>3</td>
<td>11,760</td>
<td>16,950</td>
<td>20,830</td>
<td>1176</td>
<td>1.77</td>
</tr>
<tr>
<td>4</td>
<td>11,900</td>
<td>17,540</td>
<td>20,830</td>
<td>1190</td>
<td>1.75</td>
</tr>
<tr>
<td>5</td>
<td>11,900</td>
<td>17,860</td>
<td>20,830</td>
<td>1190</td>
<td>1.75</td>
</tr>
</tbody>
</table>

**Note:** The reported values for \(3A_{2g} \rightarrow 3 \Pi_{1g}\) (P) / \(3A_{2g} \rightarrow 3 \Pi_{2g}\) for the octahedral Ni(II) complexes falls in the range of 1.6 - 1.8.
configuration in the bimetal complexes.

Infrared Spectra

The infrared frequencies of nickel(II) ketoximates and their tin(IV) complexes are listed respectively in Table VI-4 and VI-5. The comments have been advanced in support of assignments made.

The ketoximes show (Figs. VI.2-7) Chapter III) medium to high intensity broad band in the region 3350-3325 cm\(^{-1}\) and another broad weak band in the region 2600-2700 cm\(^{-1}\). These bands have been attributed to inter- and intramolecular hydrogen bonded -OH vibrations, in view of the previous assignments\(^{14,15}\). In the aldoximes the intramolecular hydrogen bonded -OH is reported\(^{15}\) around 3200 cm\(^{-1}\). The low frequency shift noticed in these ketoximes is indicative of stronger intra-molecular hydrogen bonding. Similar assignments have been made in the case of Schiff bases\(^{15}\).
Table VI-4

Infrared frequencies (in cm\(^{-1}\)) of nickel(II) ketoximates and their assignments

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Assignments</th>
<th>Ni(2-OH-acetophenone oxime)(_2)</th>
<th>Ni(3-CH(_3)-2-OH-acetophenone oxime)(_2)</th>
<th>Ni(4-CH(_3)-2-OH-acetophenone oxime)(_2)</th>
<th>Ni(5-CH(_3)-2-OH-acetophenone oxime)(_2)</th>
<th>Ni(5-Cl-2-OH-acetophenone oxime)(_2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inter-molecular hydrogen bonded -OH</td>
<td>3200br.m</td>
<td>3240br.m</td>
<td>3200br.m</td>
<td>3200br.m</td>
<td>3200br.m</td>
</tr>
<tr>
<td>2</td>
<td>C=O stretching vibration</td>
<td>1665s</td>
<td>1665s</td>
<td>1665s</td>
<td>1660s</td>
<td>1650s</td>
</tr>
<tr>
<td>3</td>
<td>Aromatic C=O stretching vibrations</td>
<td>1570s</td>
<td>1580s</td>
<td>1568s</td>
<td>1575s</td>
<td>1560s</td>
</tr>
<tr>
<td>4</td>
<td>Phenolic C-O stretching vibration</td>
<td>1335s</td>
<td>1330s</td>
<td>1335s</td>
<td>1325s</td>
<td>1325s</td>
</tr>
<tr>
<td>5</td>
<td>Ni-N stretching vibration</td>
<td>530m</td>
<td>530s</td>
<td>554s</td>
<td>550s</td>
<td>525m</td>
</tr>
<tr>
<td>6</td>
<td>Ni-N stretching vibration</td>
<td>530m</td>
<td>530s</td>
<td>554s</td>
<td>550s</td>
<td>525m</td>
</tr>
<tr>
<td>7</td>
<td>Ni-O stretching vibration</td>
<td>460m</td>
<td>440m</td>
<td>450m</td>
<td>440m</td>
<td>430m</td>
</tr>
</tbody>
</table>

Note: s = strong; m = medium; br = broad; sh = shoulder.
In ligands: Inter-molecular H-bonded -OH = 3350 - 3340 cm\(^{-1}\)
Intra-molecular H-bonded -OH = 2700 - 2600 cm\(^{-1}\); C=O stretching vibration = 1640-1650 cm\(^{-1}\); -OH deformation vibration 1618 - 1615 cm\(^{-1}\);
Phenolic C-O stretching vibration around 1280 cm\(^{-1}\).
Table VI-5
Infrared frequencies (in cm$^{-1}$) of nickel(II) ketoximate complexes with tin(IV) chloride and their assignments

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Assignments</th>
<th>Ni(2-OH-aceto phenone oxime)$_2$ SnCl$_4$</th>
<th>Ni(3-OH$_2$-2-OH-aceto phenone oxime)$_2$ SnCl$_4$</th>
<th>Ni(4-OH$_3$-2-OH-aceto phenone oxime)$_2$ SnCl$_4$</th>
<th>Ni(5-OH$_2$-2-OH-aceto phenone oxime)$_2$ SnCl$_4$</th>
<th>Ni(5-OH$_2$-2-OH-aceto phenone oxime)$_2$ SnCl$_4$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-OH stretching vibration</td>
<td>3380br,s</td>
<td>3420br,s</td>
<td>3400br,s</td>
<td>3380br,s</td>
<td>3360br,s</td>
</tr>
<tr>
<td>2</td>
<td>C-N stretching vibration</td>
<td>1650m,br</td>
<td>1655s</td>
<td>1660m</td>
<td>1640s</td>
<td>1645s</td>
</tr>
<tr>
<td>3</td>
<td>-OH-deformation vibration</td>
<td>1620s</td>
<td>1610m</td>
<td>1620s</td>
<td>1615s</td>
<td>1615m</td>
</tr>
<tr>
<td>4</td>
<td>Aromatic C=C stretching vibrations</td>
<td>1570w</td>
<td>1570m</td>
<td>1570m</td>
<td>1575w</td>
<td>1595s</td>
</tr>
<tr>
<td>5</td>
<td>Phenolic C-O stretching vibration</td>
<td>1528m</td>
<td>1550w</td>
<td>1510m</td>
<td>1535m</td>
<td>1500s</td>
</tr>
<tr>
<td>6</td>
<td>Ni-N stretching vibration</td>
<td>1490sh</td>
<td>1510s</td>
<td>-</td>
<td>1512m</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Sn-O stretching vibration</td>
<td>570s</td>
<td>520m</td>
<td>490m</td>
<td>515s</td>
<td>520m</td>
</tr>
<tr>
<td>8</td>
<td>Ni-O stretching vibration</td>
<td>490s</td>
<td>460m</td>
<td>460m</td>
<td>452s</td>
<td>440m</td>
</tr>
<tr>
<td>9</td>
<td>Sn-O1 stretching vibration</td>
<td>450m</td>
<td>420m</td>
<td>422s</td>
<td>425s</td>
<td>415s</td>
</tr>
<tr>
<td>10</td>
<td>Sn-O1-Ni stretching vibration</td>
<td>395m</td>
<td>350m</td>
<td>390s</td>
<td>340s</td>
<td>385m</td>
</tr>
</tbody>
</table>

Note: s = strong; m = medium; w = weak; sh = shoulder; br = broad
Ni(II) [2-OH-Acetophenone oxime] \(_2\) \(\text{SnCl}_4\)

Fig VI 3
Ni(II) \( \frac{[3-\text{CH}-2-\text{OH}-\text{Acetophenone oxime}]}{2} \) SnCl

Fig VI. 4.

Ni(III) \( \frac{[3-\text{CH}-2-\text{OH}-\text{Acetophenone oxime}]}{2} \)
In the nickel(II) ketoximates (Figs. VI.3,4) a broad medium to weak intensity band in the region 3280-3200 cm\(^{-1}\) is observed and is considered to be due to the intermolecular hydrogen bonded -OH of the complexes. Lead(II) aldoximates does not show such bands as both the hydroxy groups of the salicylaldoxime are utilised in the bond formation. These observations suggest that the complexes contain hydrogen bonding and closely agree with those reported in the case of aldoximate complexes. The broad weak band in the region 2700-2600 cm\(^{-1}\), due to the intramolecular hydrogen bonded -OH disappears showing the involvement of \(\pi\)-hydroxy group in the bond formation.

It is reported\(^{17}\) that the non-conjugated C=N occurs in the region 1690-1650 cm\(^{-1}\) and shifts to the lower frequency around 1630 cm\(^{-1}\) with conjugation. In these ligands three high intensity bands are observed around 1630 cm\(^{-1}\), 1613 cm\(^{-1}\) and 1590 cm\(^{-1}\). The assignments of these to the C=N stretch is made on the effects that can occur on these bands in the complexes. In Ni(II) ketoximates it is evinced that the first high frequency band shows considerable variations and appears in the region 1665 to 1650 cm\(^{-1}\), whereas the band at 1618 cm\(^{-1}\) remains inert to the complexation (Table VI-4). These evidences make the author to assign the 1630 cm\(^{-1}\) band to the \(\nu(C=N)\) and the 1618 cm\(^{-1}\) band
to the $\text{OH}$ deformation vibration. The band around 1590 cm$^{-1}$ is due to the aromatic $\text{C}=\text{O}$ vibration. The shift of the C=N vibration to the higher frequency suggest the coordination of C=N with the Ni(II) ion through nitrogen.

In the ligands a strong band is observed around 1280 cm$^{-1}$ attributable to the phenolic $\text{O}-\text{O}$ stretching vibration. This band in the complexes appears in the region 1340-1325 cm$^{-1}$ supporting the conclusion that Ni-O bonds have been setup in the complexes.

In the light of previously reported data,$^{18,20}$ it is possible to assign the $\nu$(N-N) and $\gamma$(M-O) vibrations in these complexes. The medium to high intensity band appearing in the region 554 to 525 cm$^{-1}$ may be assigned to the $\nu$(Ni-N) vibration. The presence of the single band in the above mentioned region favours the trans disposition of the nitrogen atoms in the complexes. The information available on the $\nu$(M-O) vibration$^{21}$ establishes a region between 500 to 400 cm$^{-1}$ for the $\gamma$(M-O) vibrations. The metal sensitive $\gamma$(M-O) bands have been reported by a few authors$^{22}$ below 400 cm$^{-1}$. Contemplating all these inferences the medium to high intensity band in the region 460-430 cm$^{-1}$ is assigned to the $\nu$(Ni-O) vibration. The observed single band in the M-O region$^{23}$ suggests the trans disposition of
the oxygen atoms in the complexes.

In view of all these observations the following square planar structure may be proposed for these Ni(II) ketoximates.

\[
\begin{array}{c}
\text{CH}_3 \\
\text{C} \equiv \text{N} \\
\text{Ni} \\
\text{O} \\
\text{H} \\
\text{O} \\
\end{array}
\]

In the bimetal complexes (Figs. VI.3-7) a certain characteristic changes are observed. The medium to high intensity band in the region 3280-3200 cm\(^{-1}\) of the Ni(II) ketoximates is shifted to the higher frequency and appears in the region 3420-3380 cm\(^{-1}\) as a broad and strong band. This may be looked upon as the consequence of the cleavage of the existing hydrogen bondings in nickel(II) ketoximates as result of reaction with tin(IV) chloride. The C-N stretching and the -OH deformation vibrations appear respectively
in the region 1660-1645 cm⁻¹ and 1635-1610 cm⁻¹. No significant changes are observed in the 1500-600 cm⁻¹ region. The low region spectra, however, can shed some light on the structure of these bimetal complexes.

In these bimetal complexes a medium intensity to strong band is observed in the region 570-490 cm⁻¹ (Table VI-2) and this may be assigned to Ni-N stretching vibration. In the \( \nu(M-O) \) region for these complexes one observes a range of medium to strong intensity bands which can be attributed to \( \nu(Ni-O) \) and \( \nu(Sn-O) \) of these, the bands observed in the region 490-452 cm⁻¹ are due to \( \nu(Sn-O) \) vibrations and this assignment closely agrees with Kawasaki et al., Jain and Rievest. The other bands are due to the \( \gamma(Ni-O) \) vibrations.

The previous studies on metal-halogen stretching frequencies have shown that the \( \nu(M-X) \) vibrations are sensitive to the oxidation state, coordination number of the central metal ion and are useful in predicting the geometry of the complexes. In the complexes of the type \( \Sigma M(en)_2X_2^+ \) only one \( \nu(M-X) \) band is reported for trans arrangement and two for the cis arrangement. Pay and Pinnavaia have observed \( \nu(M-Cl) \) band in the region 361-273 cm⁻¹ for zirconium(IV) and hafnium(IV) acetylacetonates.
Douek et al.,\textsuperscript{31} and Cox et al.,\textsuperscript{32} claim that \(\nu(Sn-Cl)\) occurs in the region 338-264 cm\(^{-1}\) for Sn(IV) acetylacetonates. Recently, Jons and Fay,\textsuperscript{33} Ohkaku and Nakamoto\textsuperscript{34} located the band in the vicinity of 340 cm\(^{-1}\) for \(\nu(Sn-Cl)\) in Sn(IV) acetylacetonates. In view of all these observations, medium to strong bands observed in the region 390-350 cm\(^{-1}\) is assigned to the \(\nu(Sn-Cl)\) vibration.

Adams and Chandler\textsuperscript{35} have been able to distinguish between terminal and bridging metal-halogen bonds in the case of Pt(II) and Pd(II) complexes. They have located the region 370-340 cm\(^{-1}\) for terminal \(\nu(M-Cl)\) vibrations and the region 335-300 cm\(^{-1}\) and 290-250 cm\(^{-1}\) for bridging. Taking into account of these assignments, the medium to high intensity bands in the region 320-300 cm\(^{-1}\) is assigned to the bridging \(\nu(M-Cl)\) vibrations, of the type Ni-Cl-Sn. The medium intensity bands with shoulder in the region 390-350 cm\(^{-1}\) can be considered as due to the terminal \(\nu(Sn-Cl)\) vibration. These assignments are in close agreement with the previous assignments for octahedral Sn(IV) complexes.\textsuperscript{36}

All these evidences emphasize that the square planar configuration of nickel(II) in ketoximates is changed into an octahedral one as a result of reaction with tin(IV) chloride. The following structure may be proposed to the bimetal complexes.
Due to weak source of Sn the study of the Mössbauer spectra has to be postponed. The spectral results obtained so far were not reproducible.

**SUMMARY**

A few square planar nickel(II) ketoximates have been prepared and characterised with the help of magnetic and spectral data.

Tin(IV) chloride derivatives of nickel(II) ketoximates have been obtained by reacting tin(IV) chloride with the nickel(II) ketoximates in benzene or chloroform.
medium. All the complexes are non-electrolytes and have 1:1 stoichiometry. With the help of magnetic, electronic and far-infrared spectral evidences, it has been shown that the square planar nickel(II) ketoximates have been changed into an octahedral ones as a result of reaction with tin(IV) chloride.
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   c. V. Romano, F. Maggio and T. Pizzino,


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   f. N.S. Biradar, M.D. Patil and T.R. Goudar,

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