metal ions in the present case are also bonded through one nitrogen and one oxygen atom of the ligand molecule. This is supported by the slight shift to higher atomic numbers in the curve $\Delta H_f$ (heat of complexation) against atomic number as compared to the curve of $\Delta H_f$ (heat of hydration of metal ion) against atomic number. A straight line joining Mn and Zn represents the situation in the absence of crystal field stabilization.

The order of stabilities of other transition metal ion complexes is: $\text{Cr}^{3+} > \text{Cu}^{2+} > \text{Co}^{2+} > \text{Ni}^{2+} > \text{Pr}^{3+} > \text{La}^{3+}$.

In general, SMA complexes are less stable than SMAP complexes because $\phi K_n$ of SMA is lower than $\phi K_n$ of SMAP.

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References


Stability Constants of Complexes of VO(II), Cu(II), Co(II) & Ni(II) with 2-Hydroxy-1-naphthaldehyde-4-m-chlorophenyl-3-thiosemicarbazone

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The stability constants of the complexes of VO(II), Cu(II), Co(II) and Ni(II) with 2-hydroxy-1-naphthaldehyde-4-m-chlorophenyl-3-thiosemicarbazone have been determined in 70% acetonitrile employing modified form of Irving and Rossotti titration technique at 25 °C ± 0.1°. The order of stability in terms of log $K_1$ is $\text{VO}^{2+} > \text{Cu}^{2+} > \text{Co}^{2+} > \text{Ni}^{2+}$.

TABLE 1—Stability Constants of the Complexes in 70% Acetonitrile

<table>
<thead>
<tr>
<th>Metal ion</th>
<th>log $K_1$</th>
<th>log $K_2$</th>
<th>log $\beta_3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cu$^{2+}$</td>
<td>9.54 ± 0.05</td>
<td>9.46 ± 0.05</td>
<td>19.00 ± 0.05</td>
</tr>
<tr>
<td>Co$^{2+}$</td>
<td>9.27 ± 0.05</td>
<td>9.07 ± 0.05</td>
<td>18.34 ± 0.05</td>
</tr>
<tr>
<td>VO$^{2+}$</td>
<td>9.83 ± 0.05</td>
<td>9.68 ± 0.05</td>
<td>18.91 ± 0.05</td>
</tr>
<tr>
<td>Ni$^{2+}$</td>
<td>9.29 ± 0.05</td>
<td>8.74 ± 0.05</td>
<td>17.66 ± 0.05</td>
</tr>
</tbody>
</table>

The practical proton-ligand stability constant ($\log \beta_{11}^H$) for the ligand was calculated with the help of $\bar{n}_A$ values at different $H$ values ($\phi$-meter readings). $\bar{n}_A$ is then calculated by the method of Irving and Rossotti as adopted by Jabalpurwala et al. The value of $\log \beta_{11}^H = 9.82 ± 0.05$ was then obtained from linear plots of $\log \bar{n}_A / |1 - \bar{n}_A|$ against $B$ and using relation (1)

$$\log \beta_{11}^H = B + \log |1 - \bar{n}_A|$$

For metal-ligand stability constants $\bar{n}$ and $\phi L$ were calculated by the method of Jabalpurwala et al. The values of $\log K_1$ were calculated by half integral method while those of $\log K_2$ were calculated using Olerup's least squares methods since there was not much difference between $\log K_1$ and $\log K_2$.

The average stability constants are given in Table 1. The order of stability in terms of log $K_1$ is $\text{VO}^{2+} > \text{Cu}^{2+} > \text{Co}^{2+} > \text{Ni}^{2+}$.

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