Chapter – IV

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As part of the present investigations, a set of four polymeric reagents has been developed for the removal of four metal ions from solution. The developed reagents, viz., 4-hydroxybenzaldoxime urea formaldehyde resin (4-HBO-U-F), vanillin oxime urea formaldehyde resin (VO-U-F), anisaldoxime urea formaldehyde resin (AO-U-F) and 2-nitrobenzaldoxime urea formaldehyde resin (2-NBO-U-F) are all proved as selective reagents for the removal of Cu(II), Fe(III), Zn(II) and Cr(VI) respectively.

A complete analytical study has been conducted under each head and optimum conditions are developed for the removal of these metals by the respective reagents. The concentrations studies have been carried out by the Atomic Absorption Spectrometric methods. The salient features of the metal removal methods based on the presently developed resins are summarized as follows.

<table>
<thead>
<tr>
<th>Si No</th>
<th>Reagent</th>
<th>Metal Ion Removed</th>
<th>pH</th>
<th>Time of Reflux (minutes)</th>
<th>Temp (°C)</th>
<th>Removal %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>4-HBO-U-F</td>
<td>Cu(II)</td>
<td>6.00</td>
<td>60</td>
<td>90</td>
<td>97.43</td>
</tr>
<tr>
<td>2.</td>
<td>VO-U-F</td>
<td>Fe(III)</td>
<td>3.50</td>
<td>60</td>
<td>80</td>
<td>92.50</td>
</tr>
<tr>
<td>3.</td>
<td>AO-U-F</td>
<td>Zn(II)</td>
<td>5.51</td>
<td>45</td>
<td>55</td>
<td>95.70</td>
</tr>
<tr>
<td>4.</td>
<td>2-NBO-U-F</td>
<td>Cr(VI)</td>
<td>6.00</td>
<td>60</td>
<td>50</td>
<td>89.80</td>
</tr>
</tbody>
</table>
A systematic interference study is carried out on each system and the results say that the techniques can be applied for the removal of the titled metal ions without much interference from common ions. The techniques have also been applied for the removal of metal ions from industrial effluent and the results are presented.

The principle of the metal removal action is complexation and hence an attempt has been made for the characterization of all the four metal complexes, although it is beyond the scope of the work.

The thesis is divided into four chapters.

Chapter-1 opens with an introduction of coordination polymers with special emphasis on polymeric complexes. A brief review on oxime coordination chemistry is also included.

Chapter-2 explains the materials and methods adopted in the whole work. The procedure developed for the metal removal studies, the instruments and chemicals used are explained in detail in this chapter.

Chapter-3 elaborates the details of the ion removal techniques developed, based on the four oxime polymeric reagents, along with the optimization of the techniques and the results and discussion. An attempt is made to characterize the complexes by use of CHN analysis, IR, UV-Visible (Reflectance) and TG studies.
Chapter-4 is the summary of the work.

Tables and Figures are given at the end followed by references.

As the quantum of heavy metal pollution is increasing day by day, newer techniques are needed for its removal from environmental samples. In this context, it is worthwhile and important in developing certain novel reagents for the purpose. The results of the present study are highly promising and it is hoped that these materials can be used for the removal of the studied metal ions in practice.