

4. CONCLUSION

The present study tested a simple electrolysis cell system with both stainless steel and aluminium anodes and it can be concluded that the simulated effluents of heavy metals used could be treated satisfactorily, provided 0.03M, or higher, of NaCl was added to the effluents and under suitable voltage (current) conditions. The ions that dissolved from anodes, such as iron or aluminium, were precipitated out and their concentrations remained below 1 ppm after the treatment process. The steel anodes performed slightly better than aluminium electrodes in the study.

Without the addition of sodium chloride, the treatment process was unsatisfactory for most cases except for high copper ions concentration where the copper can deposited out.

Two types of iron hydrous oxide were observed to have formed during the treatment process under different conditions. One of this was ferrite or magnetic ferric oxide which formed during the treatment of chromium ions with sodium chloride, and also during the treatment of copper solutions under magnetic stirring. Further work is required to determine the exact conditions and mechanism of the magnetic oxide formation process.

Different heavy metal ions may adsorb on different ferric or aluminium hydroxide particle surface sites. This study showed that copper will influence nickel adsorption whereas chromium adsorption was not affected by the presence of the other ions. Such adsorption phenomena require further detailed study.

The chemical co-precipitation method was equally good, if not better, for treatment of copper and nickel effluents compared to the electrolytic method in terms of efficiency of heavy metal removal. The advantage of the latter was that no additions of hydroxide and chemicals were required to produce the metal carrier hydroxides as these were generated in situ by electrolysis.

The design of the electrolysis treatment cell has to be improved to prevent the formation of insoluble hydroxide on the cathode surface (fouling process) and to lower the overpotentials at both anodes and cathodes. Promotion of heavier magnetic iron oxide formation using the electrolysis method would be desirable since this can lead to easier separation from the liquid phase e.g. by using electromagnets. The heavier oxide also settles faster.

The potentiodynamic studies were useful in identifying conditions in which passivation, and overpotentials at the electrodes could be reduced and in elucidating certain results obtained in the treatment processes.