Chapter 5
Conclusions

5. Conclusions

From the results discussed so far, following conclusions can be made:

5.1 Conclusions: EO study for DCF removal

- Among various agents/techniques, quenching using methanol was found to be the most suitable method to alleviate the effect of residual RCS on storage of aliquots withdrawn from EO experiments.
- The removal rate increased with increase in current density from 5 to 10 mA/cm^2 for DCF and intermediate products both.
- The composition of electrolyte in terms of sulfate to chloride mass ratio was found to affect the removal of DCF and intermediate products. The maximum removal (~95%) of DCF was obtained in the presence of sulfate to chloride mass ratio ranging from 0.85 to 1.35. An increase in sulfate concentration (sulfate to chloride mass ratio > 1.35) adversely affect the DCF removal.
- In comparison with Graphite anode, MMO coated anodes Ti/Ru-Sn-Sb-Ox and Ti/Ru-Ir-Ox were found to be more efficient for DCF and intermediate products removal. DCF degradation rate was fastest while using indigenously prepared MMO Ti/Ru-Sn-Sb-Ox.
- The initial phytotoxicity was found to increase marginally after EO treatment; however, its effect on the plant growth is expected to be negligible.

5.2 Conclusions: EC/PMS study for IBU removal

- EC/PMS process using iron sacrificial anode attained complete IBU removal in 30 min and performed better than Fe^{2+}/PMS process in ROC matrix.

- Quenching experiments using TBA and ethanol indicated that the contribution of sulfate radical is quite higher than hydroxyl radical for IBU removal in ROC using EC/PMS process.

- RSM study showed that acidic pH (~5.5), lesser $[PMS]_0$ (~100 mg/L), and highest current density (~4.475 mA/cm^2) is favourable for higher removal rate constants. However, higher removal rate constant does not necessarily lead to complete removal. Complete removal was achieved in near neutral pH=7.5, at $[PMS]_0$=500 mg/L, and current density =2.5 mA/cm^2.

- $[PMS]_0$ to current density ratios significantly affect both % IBU removal and removal rate constant in batch EC/PMS process. Lowest $[PMS]_0$ to current density ratio achieved the highest removal rate constants and % IBU removal within pH rage 5.5 to 9.5.

- EC/PMS process functioned quite well in continuous flow mode. The increase in flow rate from 2 to 4 L/h resulted in increase in IBU removal from 96.5 to 99.5% and decrease in residual Fe^{2+} from 10 to 3 mg/L, indicating better utilization of electrochemically generated ferrous ions.

- LC-MS results showed that DCF and IBU intermediates were hydroxylation products of indirect oxidation.