CHAPTER 4

SUMMARY AND CONCLUSIONS

This work addresses the electrochemical synthesis of conducting polymers viz., PANI, PMT, PNMA and copolymer like PANINMA, PPTNMA, PMTNMA and free radical solution polymerisation of copolymers namely poly(AMBT-co-MMA), poly(MMBT-co-MMA), poly(AMBT-co-GMA) and poly(MMBT-co-GMA) having different compositions for the application of protective coatings on mild steel. The synthesized polymers were characterized by FT-IR and $^{13}$C-NMR spectroscopy. The thermal stability was studied using theremogravimetric analysis (TGA). The corrosion performances of mild steel specimens coated with homo and different compositions of copolymers were investigated in 0.1 M HCl by using potentiodynamic polarization and EIS method. SEM was used to characterize the nature of the films formed on the metal surfaces.

The main conclusions drawn from the studies are

- Green colored stable films of PANI, PMT, PNMA, PANINMA, PPTNMA and PMTNMA were electrochemically synthesized on mild steel and well defined cyclic voltammogram showed the continuous growth of the polymer

- FT-IR spectral analysis of conducting polymers indicated that the amino group of the polymer backbone is oxidized to C=N groupings.
- The thermal analysis of the benzotriazole-methacrylic copolymers revealed that the copolymers possessed good thermal stability and undergo decomposition in two stages. The thermal stability of the copolymers was found to increase with increase in benzotriazole derivative content in the copolymers.

- From the molecular weight data, the values of polydispersity indices of the benzotriazole-methacrylic copolymers suggest that chain termination by disproportionation predominates couplings for copolymers 1 and 2. For copolymers 3 and 4 chain termination by couplings predominates disproportionation.

- Polarization studies showed that all these polymeric compounds were found to affect both anodic and cathodic processes by blocking of the active sites of the metal, i.e., it behaves like a mixed type inhibitor.

- Impedance studies indicated that the $R_{ct}$ values increased, while $C_{dl}$ values decreased for all copolymer coated samples suggesting that the copolymer molecules function by strong adhesion at the metal/solution interface.

- SEM study showed compact continuous structure for conducting copolymers, which favoured better protection than nodular and cloud like structures obtained for homopolymers.
It was found that all the studied polymeric compounds could be used to protect the mild steel in acidic chloride environment. However, benzotriazole -co- methacrylic copolymers prepared from equal concentration of benzotriazole and methacrylic monomers are suited most to protect mild steel in acidic chloride environment.