CHAPTER VI

SUMMARY AND CONCLUSIONS

The synergistic effect of 2 chloroethyl phosphonate and Zn$^{2+}$ in controlling corrosion of carbon steel immersed in an aqueous solution containing 60 ppm of Cl$^-$ has been evaluated in the present study. The influence of sodium gluconate (SG), sodium potassium tartrate (SPT) and trisodium citrate (TSC) on the corrosion inhibition efficiency of the 2 chloroethyl phosphonic acid (2 Cl EPA) - Zn$^{2+}$ system has also been evaluated. The mutual influence of biocides such as N-cetyl-N,N,N-trimethylammonium bromide (CTAB) and N-cetylpyridinium chloride (CPC) and the above inhibitor systems have been investigated.

The mechanistic aspects of corrosion inhibition have been investigated by means of UV-visible absorption spectroscopy, UV-visible reflectance spectroscopy, FTIR spectroscopy, X-ray diffraction technique, luminescence spectroscopy and electrochemical studies such as polarisation study and A.C. impedance study.

The formulation consisting of 50 ppm of Zn$^{2+}$ and 50 ppm of 2 Cl EPA has 74% inhibition efficiency (IE). The protective film consists of Fe$^{2+}$ - 2 Cl EPA complex and Zn(OH)$_2$. The protective film is found to be UV-luminescent. The 2 Cl EPA - Zn$^{2+}$ system functions as a mixed inhibitor.
The formulation consisting of 50 ppm of Zn\(^{2+}\), 50 ppm of 2 Cl EPA and 50 ppm of SG has 93% IE. The protective film consists of Fe\(^{2+}\) - 2 Cl EPA complex, Fe\(^{2+}\) - SG complex and Zn(OH)\(_2\). The protective film is found to be UV-luminescent. The 2 Cl EPA - Zn\(^{2+}\) - SG system functions as a mixed inhibitor.

The formulation consisting of 50 ppm of Zn\(^{2+}\), 50 ppm of 2 Cl EPA and 50 ppm of SPT has 95% IE. The protective film consists of Fe\(^{2+}\) - 2 Cl EPA complex, Fe\(^{2+}\) - SPT complex and Zn(OH)\(_2\). The protective film is found to be UV-luminescent. The 2 Cl EPA - Zn\(^{2+}\) - SPT system functions as a mixed inhibitor.

The formulation consisting of 50 ppm of Zn\(^{2+}\), 50 ppm of 2 Cl EPA and 50 ppm of TSC has 92% IE. The protective film consists of Fe\(^{2+}\) - 2 Cl EPA complex, Fe\(^{2+}\)-TSC complex and Zn(OH)\(_2\). The protective film is found to be UV-luminescent. The 2 Cl EPA - Zn\(^{2+}\) - TSC system functions as a mixed inhibitor.

The formulation consisting of 50 ppm of 2 Cl EPA, 50 ppm of Zn\(^{2+}\) and 50 ppm of CTAB has 85% corrosion inhibition efficiency and 100% biocidal efficiency. The formulation consisting of 50 ppm of 2 Cl EPA, 50 ppm of Zn\(^{2+}\) and 50 ppm of CPC has 60% corrosion inhibition efficiency and 100% biocidal efficiency.

The formulation consisting of 50 ppm of 2 Cl EPA, 50 ppm of Zn\(^{2+}\), 50 ppm of SG and 50 ppm of CTAB has 92% corrosion inhibition efficiency and 100% biocidal efficiency. The formulation consisting of 50 ppm of 2 Cl EPA, 50 ppm of
Zn$^{2+}$, 50 ppm of SG and 50 ppm of CPC has 76% corrosion inhibition efficiency and 100% biocidal efficiency.

The formulation consisting of 50 ppm of 2 Cl EPA, 50 ppm of Zn$^{2+}$, 50 ppm of SPT and 50 ppm of CTAB has 96% corrosion inhibition efficiency and 100% biocidal efficiency. The formulation consisting of 50 ppm of 2 Cl EPA, 50 ppm of Zn$^{2+}$, 50 ppm of SPT and 50 ppm of CPC has 78% corrosion inhibition efficiency and 100% biocidal efficiency.

The formulation consisting of 50 ppm of 2 Cl EPA, 50 ppm of Zn$^{2+}$, 50 ppm of TSC and 50 ppm of CTAB has 95% corrosion inhibition efficiency and 100% biocidal efficiency. The formulation consisting of 50 ppm of 2 Cl EPA, 50 ppm of Zn$^{2+}$, 50 ppm of TSC and 50 ppm of CPC has 86% corrosion inhibition efficiency and 100% biocidal efficiency.