CHAPTER 5

CONCLUSIONS

The following conclusions have been drawn based on the study conducted on medium carbon steels by aluminizing and nitriding. The suggestions for further studies are also given.

5.1 CONCLUSIONS

Aluminizing and subsequent nitriding is a viable method to improve the wear and corrosion resistance of medium carbon steel.

i) The dip time of 5 min provides a coating thickness of 130 μm with good adherence suitable for diffusion.

ii) The hardness of the AD specimen is increased to 800-900 Hv$_{0.1}$ from the base metal hardness of 250-300 Hv$_{0.1}$ due to the formation of intermetallics during diffusion with case depth of 180–210 μm.

iii) The surface hardness of ADN specimen is increased to about 1200 Hv$_{0.1}$. Due to the diffusion of aluminium in the Fe matrix the metastable hard intermetallic phases vanish. The effective case depth is found to be 80-100 μm.

iv) X-ray diffraction studies confirmed the presence of aluminides in the AD specimen and AlN in the ADN
specimen, which is instrumental in the significant increase of surface hardness.

v) The SEM EDAX results confirmed the presence of intermetallics in the AD surfaces and AlN in the ADN surfaces.

vi) The wear resistance of ADN specimen is increased considerably due to the presence of hard nitrides. The coefficient of friction is found to be low for ADN specimens when compared to the AD specimen and base metal.

vii) On aluminizing, the corrosion resistance increases and on subsequent nitriding, the corrosion resistance decreases as the nitride gets dissolved.

5.2 SUGGESTIONS FOR FURTHER STUDIES

i) Transmission Electron Microscopy with selected area diffraction studies may be performed in order to characterize the duplex treated specimen.

ii) High temperature wear and corrosion behaviour of the duplex treated specimen could be investigated since the ADN components may find high temperature applications.

iii) Further investigation could be done to study the corrosion mechanism of AlN layers.