CHAPTER 5

CONCLUSION

1) The effect of different creep stress levels exhibited the difference in initial strain, strain rate and fracture life times. Higher creep stress levels produced higher initial strain and strain rate, and lower fracture life times than those in lower creep stress levels tests.

2) Isothermal cyclic creeps exhibited beneficial effect on fracture lifetime which were higher than that in pure creep test regardless of the length of hold time periods. This may be due to stress relaxation during unloading periods.

3) TMF testing results would not be considered in term of deformation behaviour. The data obtained from TMF tests showed that the strain at the initial stage in each tests were different and thus it might be the effect of material heterogeneity.

4) TEM microstructure from isothermal cyclic creep test with 10 hrs. hold times consisted of very dense dislocation networks in matrix due to low deformation. The principle dislocation mechanism of precipitation strengthening was Orowan bowing which was similar in those from crept fracture specimens. For the test with 1 hr. hold time, the TEM specimen consisted of both dislocation shearing and bowing particles which shearing interaction was major dislocation interaction.

5) TEM microstructure of cyclic creep with TMF test with 1 hr. hold time was very similar to those in pure creep and isothermal cyclic creep with 10 hrs. hold time which major dislocation interaction with precipitates was Orowan bowing. For that of 5 hr. hold time, it was found both Orowan bowing and shearing particles interactions.

6) In a constant high temperature fatigue case, multiple slips system was major process to control fatigue deformation. Intersecting slip bands hindered dislocation moving affecting in internal stress increasing and then cyclic strengthening.

7) Fracture specimens under creep and isothermal cyclic tests had the similar fracture characteristic. Initiation and propagation of fracture cracks were intergranular and nucleated on surface of specimens by cavitation mechanism along grain boundaries. Subsequently, the propagation of crack continued by mixing fracture mode between intergranular and transgranular as a result of an increase in true stress due to the reduction in cross section area. Lastly, transgranular ductile which occurred dominantly on fracture surface due to rapid reduction in cross section area prior to fracture.