

Result and Discussion

This research has two types of data, namely the preliminary data before heat treatment and the outcome data after heat treatment.

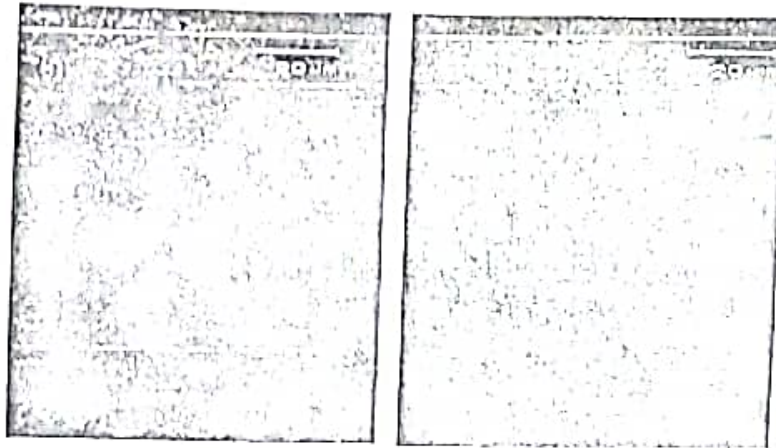


Fig. 2. Phase Structure (a) Ferrite and Pearlite (Before Heat Treatment), (b) Martensite (After Heat Treatment)

During the heating and cooling process, there will be some changes in grain size and micro structure. The result of this research showed HT3 samples heated at 900°C have greater grain size than HT1 samples that heated at 800°C and HT2 samples that heated at 850°C. The influence of temperature and holding time showed the higher the austenisation temperature given to the same materials then the greater the grain size [Zen, 2001]. The greater the grain size, the lower the hardness; because higher temperatures may lead to greater grain size, then at 900°C of temperature there was a decline in hardness.

Metallographic observation consists of micro structure observation and scale thickness observation. Figure 4 showed the variation of scale thickness at each temperature and holding time. The scale occurs when the steel was exposed to oxidation condition above 570°C; it formed multilayer scale that consist of FeO (wustite), Fe₃O₄ (magnetite) and Fe₂O₃ (hematite); wustite layer is near the surface of steel, magnetite is in the middle; and hematite is in the interface of scale-gas [Poirier, 2006].

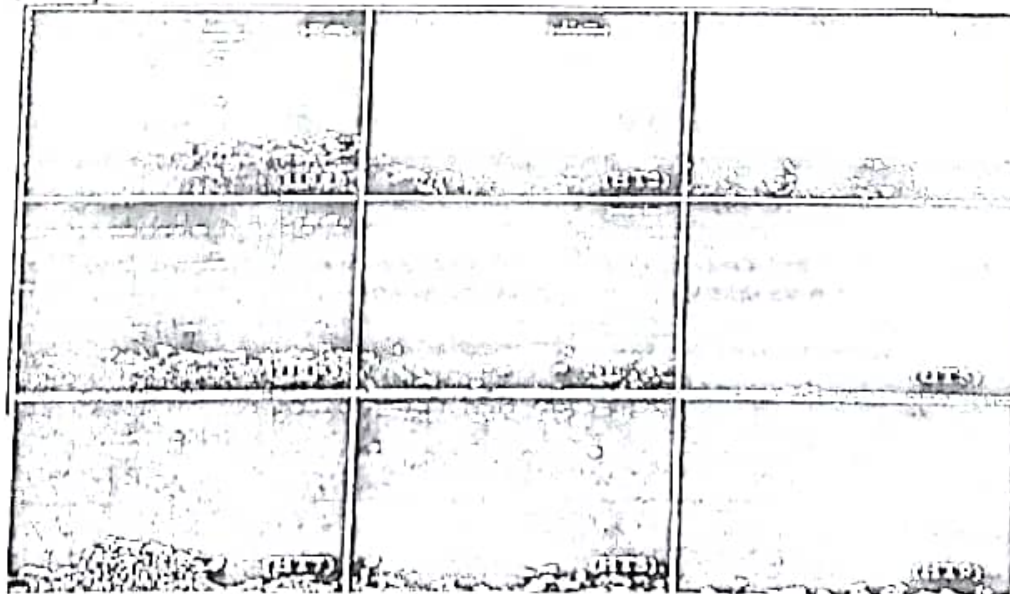


Fig. 3. The Influence of Temperature and Holding Time on Scale Thickness