

The Effect of Nitriding Treatment Variables on the Fatigue Limit of Alloy Steel (34CrNiMo6) Under High Cycle Fatigue¹

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Abstract

The aim of this research is to improve the fatigue limit for alloy steel (34CrNiMo6) by salt bath nitriding process. This property is more effective to increase the fatigue life for parts which are used in continuous cyclic loading. All the fatigue tests were implemented before and after nitriding process under rotating bending. Constant and variable capacity stresses were applied before and after nitriding processes. The nitriding process were implemented in salt bath component at three different times (1, 2, 3) hr when temperature was constant at (550°C). The depth of the nitride layer reached (0.24, 0.37, 0.5) mm. The nitriding process repeated of another specimens at the same times but the temperature was (600°C), the layer depth reached (0.28, 0.41, 0.55) mm. The formation of a high nitrogen iron phases were detected with a layer of the hard chrome nitrides on the surface. The nitriding process is forming the barriers on the surface that resist the initiation and propagation of cracks, as well as generating the compressive residual stresses which delay the progress of fatigue crack. This research deduced that the nitriding processes increased the fatigue limit and this limit is proportional to the time of the nitriding process. When the time increased, the depth of nitride layer is increased, but decreased when the temperature increased to (600°C) because of the formation of brittle phase, in spite of the increase in layer depth.

¹ For the paper in Arabic see pages (311-329).

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