
Cyclic behaviour of pure alpha titanium alloy with and without hydrogen

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Abstract

The impact of hydrogen on the low cycle fatigue behavior of T40 is investigated at room temperature. The mechanical behavior could be divided into three stages and related in terms of hydrogen concentrations, types of hydrides and their influence on mechanical properties. Different morphologies of hydrides, γ , and δ -hydrides, the formation and evolution of defects and dislocations distribution, have been studied using transmission electron microscopy (TEM) to explain the evolution of internal stresses. It revealed that the physical effect of hardening or softening on the effective stresses and back stress depends on the hydrogen content and its location (hydride or in interstitial solid solution). The relationship between microstructural observations and mechanical results is then discussed to understand the origin of softening and hardening as well as the mechanisms of crack initiation and propagation.

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