Fretting Fatigue Mechanism of Titanium Alloys with Different Microstructures

zhiyan li[1], guoqing wu[1], and zheng huang[1]

[1]Affiliation not available

May 6, 2020

Abstract

Using a high frequency push-pull fatigue testing machine with fretting pad pressed onto specimen to simulate fretting condition, the relationship between microstructures, mechanical and fretting fatigue properties of three different titanium alloys were studied systematically. Their microstructure, mechanical properties, plain fatigue and fretting fatigue behaviors were discussed contrastively through the analysis of the fracture morphology, fatigue source region and microhardness near the fracture zone. The results show that, material properties of Ti1023 and Ti55531 are better than that of Ti6Al4V titanium alloy, but Ti6Al4V titanium alloy shows the best fretting fatigue performance. For three titanium alloys, with the increase of the contact stress, the fretting fatigue strength first decreases and then tends to be stable and the depth of fretting fatigue source first increases and then tends to be stable. The contact pressure plays a dual role in the fretting process. Contact pressure promotes crack initiation and inhibits crack growth. The cyclic loading is the main inducement for the initiation of plain fatigue microcracks. The accumulation of plastic deformation is the main cause of microcracks initiation in fretting fatigue.

Hosted file

`Fretting_Fatigue_Mechanism_of_Titanium_Alloys_with_Different_Microstructures428.doc` available at https://authorea.com/users/317002/articles/447089-fretting-fatigue-mechanism-of-titanium-alloys-with-different-microstructures