

## عنوان مقاله:

EFFECT OF SHORT HEAT TREATMENT ROUTES ON THE TRIBOLOGICAL PROPERTIES OF Ti-6Al-4V ALLOY

## محل انتشار:

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## خلاصه مقاله:

In this research, the effect of annealing and aging temperature as well as the effect of quenching media on the microstructure, hardness and dry sliding wear behavior of Ti-6Al-4V alloy has been studied. Cylindrical samples with the diameter of 10 mm and the height of 20 mm were solutionized at 930°C and 1060°C for 600 seconds and then were quenched in the cold water and in the air. The samples were aged at different temperature of 480°C, 550°C and 610°C for 360 s to increase the hardness. Heat treated samples were tested using standard pin-on-disc test machine at the applied loads of 100, 150 and 200 N. Microstructural investigations using scanning electron microscope revealed that for the samples solutionized at 930°C and quenched in the water, the microstructure is composed of primary  $\alpha$  and high volume fraction of martensitic  $\alpha'$  phase with fine precipitated of  $\beta$  between martensitic lathes. In the case of air cooled samples, transformed  $\beta$  has also been appeared in the vicinity of primary  $\alpha$ . For the samples solutionized at 1060°C and quenched in the water, fully martensitic micro structure with fine  $\beta$  precipitates was observed. For the sample solutionized at 1060°C and air quenched, plate like  $\alpha$  and lamellar grain boundary  $\beta$  were detected. The maximum hardness value relates to the sample solutionized at 1060°C and quenched in water which is equal to 433 HV. Different wear mechanisms, including oxidative wear, scratch, and delamination occurred at the worn surfaces at different applied loads. For the samples quenched in the water, the oxidative wear mechanism governing at low applied load and oxide debris was observed as separate or compacted particles which formed in the contact between pin and steel counter face detached from the sample. At higher applied loads, delamination and scratch mechanism was also observed and metallic plate like debris was detached from the sample. Mechanically mixed layer (MML) was formed on the surface of the pin at high applied loads and for the samples with low hardness value adhesion marks were also revealed on the steel disc. The minimum weight loss in the wear test is related to the sample quenched from the 1060°C in the cold water and aged at 550 °C.

## کلمات کلیدی:

Ti-6Al-4V alloy, Tribology, Heat treatment, Microstructure, Hardness

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