

Dental alloys play a vital role in aesthetic and functional for teeth as a result of accidents or diseases. Dental alloys exposed to corrosion problem as a result of reaction with oral environment. In this work, studied the effect of laser surface treatment (LST) on corrosion behavior and surface hardness of dental alloy (316L Stainless steel) in artificial saliva medium with different laser energies.

Laser surface treatment was performed by pulsed Nd:YAG laser and with energies 200mJ, 300mJ and 400mJ at wavelength 1064nm with pulse duration 10ns and spot diameter 1mm.

Surface characterization for untreated and laser treated alloy was studied by optical microscope which indicates that the microstructure of untreated alloy consist of dendrites regions for dental alloy. The microstructure for treated alloy with laser shows that the small size of the grain of austenite phase which gives more refinement.

Hardness measurements for laser untreated and treated alloy were performed by Vickers hardness test which shows increasing of hardness values for laser treated alloy.

The corrosion test was performed at different temperatures with experimental artificial saliva pH=5.7. The presence of artificial saliva at this pH with laser treatment made  $E_{corr}$  and  $I_{corr}$  for laser treated alloy show less value as compared with untreated alloy.

The results showed that corrosion resistance of alloy were increased after laser treatment due to the fact that laser radiation has caused a smoother surface, and there was a decrement in the corrosion rate (CR) for alloy. Most of corrosion

#### ***Abstract***

ii

potential  $E_{corr}$  values for alloy shifted toward the noble direction when compared with untreated alloys.

The cyclic polarization curves for laser treated alloy indicate that dental alloy were more resistant to pitting corrosion, while untreated alloy was less resistant to pitting corrosion.