Abstract The aim of this work is modify titanium surface by use pulse Nd:YAG laser and study the effect of laser energy on the corrosion behavior after immersion in the saliva solution. Dental alloys and biological metals such as titanium and its alloys play a main role in repairing for missing teeth. These metals and its alloys risky to corrosion problem because of reaction with oral environment.

In this work, pure titanium (Grade 2) was used and examined its corrosion behavior in artificial saliva as oral environment and the results were compared between the base metal (untreated) and treated specimens with different energies. The work began by irradiation the samples using laser beam. Laser surface hardening treatment was performed by Nd:YAG pulse laser. Laser energies were used in this work (850, 940, 1000, and 1600) mJ at fixed 1 Hz and 1064 nm. The laser beam frequency was changed between 1Hz and 3 Hz and wavelength was also changed between 1064nm and 532 nm, with pulse duration 6 ns and spot size 2 mm for all above conditions. The Optical Microscope and the Scanning Electron Microscope were used for examine microstructure for untreated and treated specimens. Vickers Micro hardness was used to study the effect of the laser parameters on the hardness measurements for treated and untreated samples. It was indicated that hardness values of treated specimens were increased after irradiate with laser beam at different energies with change in frequency and wavelength. The c solution = 5.3. Open circuit potential (OCP), Tafel extrapolation technique, and cyclic polarization were investigated. Tafel lines was employed to measure the change in corrosion current with change in

potential in order to measure the corrosion current (Icorr), corrosion potential (Ecorr) and corrosion rate (CR) for all specimens. In this work, this cyclic polarization was done for treated and untreated samples to know the passivity of oxide film on titanium surface if its break down and susceptibility of metal to pitting corrosion. The results indicated that the hardness values were increased for treated specimen after irradiate with laser beam at frequency (1 and 3) Hz and wavelength (1064 and 532) nm. TiO2 and Ti2O3 were discovered on the surface of the samples that treated as observed in XRD of the sample that treated at (850 and 1000) mJ with 1 Hz and 1064nm in which gave higher corrosion resistance than other samples.