

Surface Modification of Titanium Alloy with Laser Treatment

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Abstract : The effect of laser surface treatment parameters on the residual strength of titanium alloy has been investigated. The influence of the laser surface treatment on the bonding strength between the titanium and poly-ether-ketone-ketone (PEKK) surfaces was also evaluated and compared to those offered by titanium foils without surface treatment to optimize the laser parameters. Material characterization using an optical microscope was carried out to study the microstructure and to measure the mean roughness value of the titanium surface. The results showed that the surface roughness shows a significant dependency on the laser power parameters in which surface roughness increases with the laser power increment. Moreover, the results of the tensile tests have shown that there is no significant dropping in tensile strength for the treated samples comparing to the virgin ones. In order to optimize the laser parameter as well as the corresponding surface roughness, single-lap shear tests were conducted on pairs of the laser treated titanium stripes. The results showed that the bonding shear strength between titanium alloy and PEKK film increased with the surface roughness increment to a specific limit. After this point, it is interesting to note that there was no significant effect for the laser parameter on the bonding strength. This evidence suggests that it is not necessary to use very high power of laser to treat titanium surface to achieve a good bonding strength between titanium alloy and the PEKK film.

Keywords : bonding strength, laser surface treatment, PEKK, poly-ether-ketone-ketone, titanium alloy

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