Abstract

Laser shock processing (LSP) was performed on 6009 Al and C70275 Cu - Ni alloys samples to reveal its effect on their microstructure and mechanical properties. The samples are prepared as flat samples of disc shape with a diameter of 20 mm and a thickness of 4 mm of each. The XRay
fluorescence (XRF) technique was used to analyze the elemental composition for all samples which were used in this investigation.
The experimental procedure of the LSP is done by using a convergent lens to deliver 100 - 700 mJ (1064 nm) of energy and 10 ns laser pulse produced by Q-switched Nd: YAG laser of 1.5 mm spot size in diameter. Doubled distilled deionized Water (DDDW) of 3mm depth is used as transparent confining layer. The effects of the LSP parameters such as laser
pulse energy, number of pulses and pulse repetition rate on the surface micro-hardness, surface roughness, corrosion resistance and wear resistance are also investigated. The experimental results showed that, the surface roughness increases and higher micro-hardness lends to be generated near the surface of the samples. The surface roughness and micro-hardness values are both increased but in dissimilar values depending on the LSP parameters used in this project.
The corrosion and wear results showed that the best laser efficiency can be obtained under the optimum conditions of higher pulse repetition rate of 5 Hz, high laser energy of 700 mJ and high number of pulses (100 pulse). All corrosion results were obtained from polarized curves under different LSP parameters.
The optimum laser efficiency during corrosion tests at conditions (energy 700 mJ, number of pulses 100 pulses pulse repetition rate 5 Hz) was reached to (95.27% for 6009 Al) and (99.7 % for C70275 Cu – Ni). In
addition, the wear rate results revealed that the values of wear rate are

reduced by 83.66 % and 84.77% for 6009 Al and C70275 Cu – Ni respectively. SEM and XRD measurements has been carried out for all samples at different LSP parameters, before and after corrosion and wear tests.