ABSTRACT

One of the methods that employed to improve the corrosion resistance of metals and alloys is laser surface treatment.

This work improved the mechanical properties of mild steel with two different compositions by laser shock peening (LSP).

Chemical composition analysis was used to knowledge the elemental composition of samples also, the surface roughness measurement was conducted for all specimens before laser treatment to ensure that all specimens have approximately the same roughness (Ra = 0.047μm).

LSP was implemented using Nd:YAG laser (1064nm) with a pulse duration of 10ns to reduce the corrosion rate .Two methods of corrosion tests namely weight loss method and the polarization method were used to evaluate the corrosion rate.

The effect of different laser parameters were studied to get better value of laser efficiency such as laser beam spot size, the number of pulses, laser energy and the depth of the confinement layer. The corrosion results show that the best laser efficiency was obtained under the optimum conditions of a confinement layer (depth of DDDW 4mm) , smaller spot size of 1.2 mm , higher laser energy of 400mj as well as higher number of pulses (90 pulse).

Various techniques were used for the purpose of obtaining results of sample structure before and after corrosion experiments with high accuracy such as OM and SEM .This research has proved that the LSP is a good technique for improving corrosion resistance because the corrosion rate was reduced by 6.5 times compared to the case of non-use of laser , the laser efficiency increased to 95.39% .