

The influence of Laser parameters on steel Micro-structure and mechanical properties ¹

Tahseen Bargouth²

Mohammad Salameh³

Ibraheem Abed Al-Hadi⁴

Abstract

Various Technologies are used in Heat Treatment (traditional and new) for steel Samples , but Heat Treatment technology by Laser beam is the forefront one of new technologies for various steel sorts (carbon and alloy steels) , aiming to avoid obstacles and faults which may occur by using other technologies. So Heat Treatment Technology by Laser beam has a wide range of applications for treatment of steel sorts which have industrial importance and specialized research. Very fast heating and cooling of steel sample's surface layers lead to great changes in both Micro-structure and mechanical properties of these layers.

This research aims to study the influence of main parameters values for Laser beam CO₂ in the Micro-structure and mechanical properties of carbon steel sample's surfaces (low , medium & high carbon steel).

It was shown that theoretical & practical abundant study is required to achieve a Heat Treatment System by Laser beam CO₂, whose parameters values must be Optimum (Laser capacity, intensity distribution, Laser beam mode, Laser spot diameter, treatment rate & period ..etc) All that aimed to achieve required Heat Treatment (without any local melting of surface's layers) and to achieve proposed Micro-structure & mechanical properties of these layers.

The results of this research show that there is a wide range of value's changes of CO₂ laser speed & capacity, which does not lead to any local melting of treated samples' surface , but it leads to Micro-structure changes, that occurred to depth more than (0,5mm) in some cases, and followed by changes in mechanical properties to the same depth.

¹ For the paper in Arabic see pages (115-127).

² Mechanical Design Engineering Department -FMEE- Damascus University.

³ Mechanical Design Engineering Department -FMEE- Damascus University.

⁴ Scientific Studies and Research Center (SSRC)- Damascus.