ABSTRACT

In order to improve mechanical and corrosion resistance of AZ91 magnesium alloy carbon single ion implantation has been carried out by using 2MV Pelletron accelerator on the polished magnesium alloys surface. X-Ray diffraction (XRD), scanning electron microscopy (SEM), Vickers hardness test, corrosion tests are used to analyze the surface microstructure and mechanical properties. XRD results shows that the untreated and treated samples include α Mg and β-$Al_{12}Mg_{17}$ phases. XRD results also reveal that after the carbon in implantation the diffraction peak position and intensity of all the phases shifted obviously.

SEM results indicate that after singly carbon ion implantation on the surface of AZ91-D Mg- alloy changes and surface modification has been obsrved. During implantation by increasing the amount of doze i.e from 1.261 ion/cm^2 to $8.4x10^{14}$. ion/cm^2 and depsoition tie the rate of deformation and dislocation density also increases due to appearance of certain micro cracks along vertical and orizone tensile direction. Instead of micro cracks, the occurance of scattered granular, glowlar and cubic pasticles can be seen in treated sample 1,2,3 which shows the accumulated stess of cabon ion implantations and formation of carbon ion implanted barrier layer on the surface of treated samples for corrosion protection and to increase hardness. These changes and surface modification can not be seen on undopped sample. So after SEM analysis three zones on the surface of AZ91-D Mg-alloy can be identified.

Micro hardness occurs due to micro structural defects, formation of dislocation clusters and re-adjustment of interstitial sites which depends on dislocation density during C- ion implantation. Enhancement in dislocation density is due to increase in carbon ion flounce from 1.26x1013 ions/cm^2 to 8.4x1013 ions/cm^2 which shows that variation in harness is directly related to ion doze, crystallite size , defects and increasein dislocation density due to increase in ion flounce. As a result the barrier force is also increased due to this dislocation movement and consequently hardness increase.

Weight loss method is most commonly used technique of all corrosion rate measurements. In which all clean samples of interest area measured, weighted and then exposed to a corrodent for a known period of time and then clean (if necessary) after that reweighted. The results and measurements describe that due to increase in ion doze of implantation corrosion resistance also increases (directly related) and loss of mass of specimens decreases. Which reflect enhancement effect of corrosion resistance.