

ABSTRACT

Carbon ions irradiation effects on Al-5052 alloy have been studied in this work at different ion doses. The specimens were irradiated by singly charged carbon ions (C^+) at 0.25×10^{14} , 0.5×10^{14} , 0.75×10^{14} , 1×10^{14} , 1.25×10^{14} ions- cm^{-2} using Pelletron Accelerator. The energy of the carbon ions was kept same at 300 keV for all the doses. The study of X-ray diffraction showed variation in the width, intensity and position of Al peaks on increasing ion dose. The crystallinity of Al-5052 was decreased at lower ion dose (0.25×10^{14} ions- cm^{-2}), while, irradiation at higher doses improved the crystallinity. The preferred orientation of Al-5052 alloy was along (220) plane which remained unaffected with increase of the ion dose. The structural changes in C^+ irradiated alloy were illustrated on the basis of thermal spike model of irradiation. The surface morphology of Al-5052 was studied using scanning electron microscope (SEM). The results showed carbides formation in the alloy that were more prominent at lower ion dose (0.25×10^{14} ions- cm^{-2}). At higher doses, surface heating effects were noticed along with few cracks. The Vickers hardness was increased at 0.25×10^{14} ions- cm^{-2} and then indicated a decreasing trend with increase of the ion dose. The electrochemical corrosion tests of the material were performed in 3.5 wt % NaCl solution using a Gammery potentiostat. The Potentiodynamic polarization curves were obtained using both anodic and cathodic polarization of the samples. The results revealed a decrease in the corrosion rate (CR) of the sample after C^+ irradiation at different doses. The CR was linearly decreased due to ion irradiation up to 0.5×10^{14} ions- cm^{-2} , while with increase of the ion dose to 1×10^{14} ions- cm^{-2} , the CR remained almost constant. With further increase in the ion dose to 1.25×10^{14} ions- cm^{-2} , the CR was decreased. The post-corrosion SEM images showed a decrease in the material's corrosion after C^+ irradiation. The changes in CR were demonstrated on the basis of crystallinity changes as well as carbides formation in the material upon ions irradiation.