Abstract

The effect of laser irradiation on surface, structural, electrical and mechanical properties of cadmium (Cd) has been investigated. A Q-switched Nd: YAG laser (532 nm, 6 ns) has been employed at various fluences ranging from 0.52 J/cm^2 to 2.59 cm^2 to expose Cd under oxygen environment at a pressure of 20 Torr. The surface morphology of central ablated areas of Cd explored by Scanning Electron Microscope (SEM) reveals the hexagonal shaped networking channels at lower fluences, whereas ridges and cones are formed at higher fluences. At the peripheral ablated areas, the ring shaped channels and droplets are formed whose density increases with increasing fluence except at the highest fluence, where they are completely transformed into cavities. The compositional analysis explored by XRD confirms the formation of CdO phase at moderate fluences. The modifications in residual strain and stress are well correlated with the variation in dislocation line density with increasing laser fluence. The four probe method and Vickers micro hardness testing technique were employed to investigate the modifications in electrical and mechanical properties of laser exposed Cd. The initially decreasing and then increasing trend of crystallite size explored by XRD is well correlated with the electrical behavior of laser irradiated Cd. Similarly the initially an increase and then a decrease in dislocation line density with increasing fluences establishes a good correlation with the variation in micro hardness of irradiated Cd.