Abstract

Laser Produced Plasma (LPP) was employed as an ion source for the modifications in surface, electrical and mechanical properties of poly methyl methacrylate (PMMA). For this purpose Nd:YAG laser (532 nm, 6 ns, 10 Hz) at a fluence of 12.7 J/cm^2 was employed to generate Fe plasma. The flux and energy measurements of laser produced Fe plasma ions were carried out by employing Thomson Parabola Technique in the presence of magnetic field strength of 0.5 T, using CR-39 as Solid State Nuclear Track Detector (SSNTD). It has been observed that ion flux, ejected from ablated plasma was maximum at an angle of 5^0 with respect to the normal to the Fe target surface. PMMA substrates were irradiated with Fe ions of average energy of 0.85 MeV at various ion fluxes ranging from 38×10^5 ions/cm^2 to 18×10^7 ions/cm^2 controlled by varying laser pulses from 3000 to 7000. Optical microscope and Scanning Electron Microscope (SEM) were utilized for the analysis of surface features of irradiated PMMA. Results depicted the formation of chain scission, crosslinking, dendrites and star like structures. To explore the electrical behavior, four probe method was employed. The electrical conductivity of ion irradiated PMMA was increased with increasing ion flux. The surface hardness was measured by shore D hardness tester and results showed the monotonous increment in surface hardness with increasing ion flux. The increasing trend of surface hardness and electrical conductivity with increasing Fe ion flux has been well correlated with the surface morphology of ion implanted PMMA.