ABSTRACT

Surface functionalization has been extensively used to desirably alter the structural, electrical and wettability properties of variety of materials by plasma treatment. Self-designed and fabricated Dielectric Barrier Discharge (DBD) system is used as an irradiation source for surface modifications of Cadmium (Cd). Samples of Cd are exposed to DBD plasma for various durations of 0.5, 1, 1.5, and 2 hours at atmospheric conditions. Optical microscopy and SEM analyses reveal the formation of pores, cavities and micro-bumps at the lowest exposure time. Whereas, moderate exposure time is responsible for enhanced surface roughness with the growth of rectangularly shaped granular morphology along with diffusive bumps and cavities. At the highest exposure time, the surface becomes smooth. EDX analysis confirms that oxygen content increases in plasma treated Cd as compared to virgin target. XRD analysis shows that no new phase of Cd is formed after the plasma treatment. However, initial decrease and then an increase in crystallite size is observed with increasing exposure time, and vice versa is true for dislocation line density, stress and strain. The work function varies from 4.43 eV to 4.57 eV which decreases with exposure time due to increased roughness, however, it becomes maximum at 2 hours. Wettability goes on decreasing with surface roughness due to trapping of air, however, it shows hydrophilic nature at maximum exposure due to surface smoothening.