Abstract

Current research work is inspired by the various properties of aluminium such as low cost, low corrosion resistance, less wear resistance and the most important feature of being low density or light-weighted material which make it pliable in wide range of industrial applications. For example, in construction purposes, in packaging industry, space craft applications and in electronic uses. It is used as single metal as well as in compounds with different elements i.e. Aluminium nitride, aluminium phosphate, and oxides etc. depending upon the desired features. Many systems have been used for deposition of nitrogen ions in aluminium but here we used Cathodic Cage Plasma Nitriding system (CCPN) and magnetron for physical vapor deposition (PVD) for pre-CCPN and post-CCPN treatment of Al in order to achieve the good tribological properties. XRD, SEM investigation and Vickers's micro hardness was performed to study acquired results of experiment.

X-ray diffraction examination shows the elemental composition of pre and post cathodic cage plasma nitride aluminium, indicating the transformation of crystal structure of base material (from face centered cubic to hexagonal closed packed structure) resultantly variation in lattice parameter also has observed. The deep study of these results shows an increase in hardness of post-CCPN treated samples. SEM micrographs shows the rough surface for pretreated samples while for the post CCPN aluminium, smooth and uniform surface along with high hardness in comparison with untreated, single coated (TiN or CCPN) samples and pre-CCPN substrate material is observed. Microhardness tester with load of 10gf shows an increase in hardness which becomes double (600 to 1200HV) with duplex treatment. The reason behind the increase in hardness is reduction of surface defects after the double coat in PVD titanium nitriding and cathodic cage plasma nitriding.