

## **ABSTRACT**

A 2.3 kJ Mather type Dense Plasma Focus (DPF) device, energized by 32  $\mu\text{F}$ , 12 kV capacitor, is used to deposit TiN film on Al alloy ( $\text{AlFe}_{1.8}\text{Zn}_{0.8}$ ) samples. The samples are placed at different (5 cm, 9 cm and 13 cm) axial distances from the tip of anode for different number (10, 20, 30, 40 and 50) of focus shots at different ( $0^\circ$  and  $10^\circ$ ) angular positions. The exposed samples are characterized by using X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM) and Vickers Micro-Hardness Tester. X-Ray Diffraction (XRD) spectra showed successful deposition of polycrystalline TiN along with some AlN phases on Al alloy samples placed at 9 cm distance from anode tip and  $0^\circ$  degree angular position for 30 numbers of focus shots. The XRD spectra of films deposited at  $0^\circ$  and  $10^\circ$  show that the intensity of TiN is decreased when the angle is increased. SEM analysis showed very thick and smooth film of light gray color for the sample exposed to 30 focus shots at 9 cm axial distance. The thickness of the deposited film is increased with increasing the number of focus shots and decreased with increasing angle for all samples. Vickers Micro-Hardness analysis showed a gradual increase in hardness of the samples with increasing the number of focus shots. Maximum hardness of about 80 HV is observed for sample exposed to 50 (maximum) numbers of focus shots at 9 cm axial for  $0^\circ$  angular position, which is almost twice the hardness value of the un-exposed sample. Hardness of the film is decreased as the axial distance of the sample is increased from the anode tip. A decrease in hardness of deposited film is observed with increasing the angle of sample with respect to anode axis.