

ABSTRACT

Pulsed DC plasma has been widely used for the deposition of thin composite films on different substrates. We deposited nickel-PTFE composite thin films on two substrates (silicon and glass) for different powers (100, 125, 150, 175 & 200 W), pressures (1, 2, 3, 4, 5, 6mbar) and gas compositions (10%N₂+90%Ar, 20%N₂+80%Ar, 30%N₂+70%Ar & 40%N₂+60%Ar) of argon and nitrogen gas. The effects of these parameters on the various surface properties of nickel-PTFE composite thin films are studied.

X-ray diffraction (XRD) technique is employed for the identification of different phases and their crystal structure of the composite (nickel-PTFE) films deposited for different parameters. FTIR analysis is carried out to study the chemical bonding between the elements forming composite films. Surface morphology and roughness of the deposited composite films are investigated by using scanning electron microscope (SEM) and atomic force microscope (AFM). XRD results reveal the formation of new diffraction planes related to Ni₄N, SiC, PTFE and Ni₃N compounds confirming the formation of composite films. FTIR study exhibits the formation of bonding like CF₂, SiF₂, Si-F, C = C, N = O, C = O, C – H and N – H in the composite films deposited for different parameters (already mentioned above). SEM results show that shiny composite films are smooth and gray in appearance showing no agglomeration of particles. This confirms the homogeneous distribution of particles. Nano-rods are observed for the composite film deposited at 200 W powers. The minimum surface roughness is 13.7 nm for the film deposited at 125 W power. Results show that the surface properties of the composite films are directly related with the parameters like pressure, power and gases composition.