

Abstract

The work presented in this thesis addresses the ion assisted deposition of tungsten carbonitride thin films using conventional 2.3 kJ dense plasma focus device. This work is motivated by remarkable properties of tungsten carbonitride thin films which are being used in many applications including as a diffusion barrier in semiconductors and for decorative coatings. Properties of deposited thin films varies with varying N_2/C_2H_2 ratio. The deposition of tungsten carbonitride thin films using different techniques based on plasma have been reported earlier but the use of plasma focus technique is one of the potential methods which is not only simple but also provide high deposition rate and good adhesion to thin films. The deposited thin films were characterized by employing XRD, SEM and four-point probe characterization techniques to study the structural, morphological and electrical properties. Deposition of tungsten carbonitride thin films by using tungsten target on SS-304 by using dense plasma focus was studied by varying the gas concentrations and keeping constant the distance from target to substrate, angular position and the number of focus shots. Systematically, concentrations of Nitrogen and Acetylene were varied to study the effect of Nitrogen and Carbon contents in deposited film. XRD study shows crystalline nature of the deposited film. Surface morphological results showed grain size increased with increasing carbon contents. The sheet resistance of deposited thin films was increased by increasing the Carbon contents.