ABSTRACT

The presented dissertation thesis includes researches of silicon-containing diamond-like carbon (Si-DLC) coatings (0-32% Si), which were prepared on silicon wafers by Radio Frequency Plasma Enhanced Chemical Vapor Deposition (RF-PECVD) method using thetramethylsilane (TMS) precursor. Here, it was reported that Si-DLC coatings can be effectively modified by two types of fluoroalkylsilanes, which results in significant enhancement of physical-chemical properties. The ultrathin structures were created by Vapor Phase Deposition (VPD) method and Liquid Phase Deposition (LPD) method using with 1H, 1H, 2H, 2H-perfluorodecyltrichlorosilane (FDTS) and (3, 3, 3-trifluoropropyl) trichlorosilane (FPTS). In LPD technique FPTS and FDTS solutions were performed, for which viscosity and surface tension were estimated. Deposited layers were analyzed in terms of thickness, coverage, wettability, structure and coefficient of friction. Frictional properties were investigated in nano-, micro- and macroscale. It was found that the presence of silicon enhances the chemisorption of fluoroalkylsilanes on Si-DLC coatings by creating adsorption anchoring centers. In consequence, a decrease of adhesion and an increase of hydrophobicity along with a decrease of coefficient of friction were observed. Experimental results indicate, that tribological properties are correlated with dispersive and acid-base components of the surface free energy (SFE) as well as with the work of adhesion. Systems composed of perfluoroalkylsilane SAM structures deposited on Si-DLC coatings are highly promising candidates as material for electromechanical applications.