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Nanotribology of high performance amorphous carbon films D.S. GRIERSON, A.V. SUMANT, K. SRIDHARAN, E.E. FLATER, University of Wisconsin-Madison, T.A. FRIEDMANN, J.P. SULLIVAN, Sandia National Laboratory, R.W. CARPICK, University of Wisconsin-Madison — High performance carbon films are attracting a great deal of interest as candidate materials to improve the tribological characteristics of mechanical parts ranging from the macroscale to the nanoscale. We have investigated the nanotribology and the surface chemistry of two types of diamond-like carbon (DLC) films. One, known as tetrahedral amorphous carbon (ta-C), is grown with Pulsed Laser Deposition (PLD). It is essentially hydrogen-free and contains a high (up to ∼80%) fraction of sp3-bonded carbon. The other is grown with Plasma Immersion Ion Implantation and Deposition (PIIID). This film is a hydrogenated DLC with a lower fraction of sp3-bonded carbon (30-50%). The nanotribology is characterized quantitatively with atomic force microscopy (AFM) utilizing silicon AFM tips coated with diamond, DLC, or ta-C. The surface chemistry is characterized via near edge x-ray absorption fine structure (NEXAFS) spectroscopy. We will discuss how doping the DLC and annealing the ta-C affects the nanotribology and surface chemistry of these films. Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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