coatings. Magnetron sputtered Cr containing non-hydrogenated DLC coatings were tested against Al, Cu, Mg and Ti pins using a vacuum tribometer. Pin-on-disc tests were performed in ambient air (40-55 % RH) and argon.

In argon, the highest coefficient of friction (COF= 0.63) of the DLC coatings was observed against the Al pin, followed by the Ti (0.52), Cu (0.48) and Mg (0.36) pins. Significant adhesion and material transfer occurred from Ti to the DLC coating surface causing severe damage of the DLC coating in argon. The material transfer and the wear of the DLC coating were negligible against Cu in argon.

In contrast to the argon tests, the wear rate of the DLC coatings in ambient air against Cu and Mg were higher than against Al and Ti. The average COF values of the DLC coatings against Al and Ti were around 0.10. The COF exhibited two different regimes against Cu and Mg: First, it fluctuated around rather high values (0.46 against Cu and 0.35 against Mg) for some sliding distance (5.4x10⁷ revolutions against Cu and 8.3x10⁷ revolutions against Mg). Then, it gradually decreased to lower values (0.18 for Cu and 0.15 for Mg).

Formation of easy shear tribolayers on the contact surfaces of the Al and Ti pins was proposed for the improved tribological performance of the DLC coatings against these metals in ambient air. In this presentation, the friction and wear mechanisms of the non-hydrogenated DLC coatings will be discussed in terms of the properties of the counterface metals, interactions (adsorption and oxidation) with the environment, and characteristics of the tribolayers forming.

Keywords: Diamond like carbon, including carbon nitride, Aluminum, Tribology, Environment

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**[15.9.9]**

**Effects of W Implantation into 321 Stainless Steel Substrate on the Mechanical Properties of Deposited DLC Films**

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Diamond-like carbon (DLC) films possess high hardness, low friction coefficient, high chemical inertness and corrosive resistance and other attractive mechanical properties. However, due to the large differences in the physical and mechanical properties between DLC films and soft substrates, high residual stress results when DLC films are deposited on a soft substrate. This leads to poor film adhesion and limits the applications.

To reduce the high residual stress in the DLC film especially in the vicinity of the interface, it is very important to optimize the transitional and interfacial layer between the DLC film and the soft substrate. In this work, DLC films were deposited on 321 stainless steel substrates that had been pre-implanted with W. W ion implantation changed the surface chemistry of the 321 substrate, and the loading capacity and the resistance to plastic deformation of the enhanced substrate surface was observed to be markedly improved. At the same time, W is known for its chemical affinity to carbon and ion-beam-induced carbonization occurred on the steel surface. Therefore, W ion implantation not only creates a modified surface layer with higher hardness but also produces a carbon-rich layer that bodes well for the subsequent DLC deposition process by reducing the residual stress and improving film adhesion.

Keywords: 321 stainless steel, W, ion implantation, DLC film, adhesion

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**[15.9.10]**

**DLC films on Ti6Al4V alloy for critical space application**

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Nowadays, DLC films as a solid lubricant on different kind of surfaces of different materials represent an important area of investigation, including a wide industrial area for immediate application. Researches concerning space requirement for satellites, have deserved special attention[1]. In spite of being a solid lubricant device, a-c:H film can be used as anti-cold welding layer in ultra-high-vacuum environment. It will be presented in this work the DLC film as a protective coating on roughened Ti6Al4V surface device used for holding the satellite solar panel. High roughness Ti6Al4V surface is necessary for keeping mechanical stability and DLC film will play the hole of anti-cold welding even