

Diamond Like Carbon Dlc Coating

Mosbeh Kaloop,Jongwon Jung

Applications of Diamond-like Carbon Coatings Abdul Wasy Zia,2025-04-01 An incisive guide to diamond-like carbon (DLC) coatings and their contemporary applications In Applications of Diamond-like Carbon Coatings, distinguished researcher Dr. Abdul Wasy Zia delivers an insightful and up-to-date discussion of the latest advancements in new and non-conventional applications of diamond-like carbon (DLC) coatings. The editor explains the transformation of typical topics into advanced applications of DLC, including tribology for future transportation solutions, green lubrication, invasive implants, MEMS, optical devices, and more. The book also details advanced and contemporary trends in DLC coatings, like material informatics involving artificial intelligence and machine learning, and new, net-zero applications, including energy storage batteries. Readers will also find: A thorough introduction to applications of DLC coatings in mechanics, transportation, medicine, and electrical and optical device manufacture Comprehensive explorations of emerging trends in DLC coatings, including green energy, data-centric approaches, textile and plastics, and carbon circularity from DLC coated products Practical discussions of how small and medium industries can design and develop DLC coatings for broad engineering applications Complete treatments of the benefits and opportunities presented by DLC coating applications Perfect for postgraduate students and researchers with an interest in DLC coatings, Applications of Diamond-like Carbon Coatings will also benefit scholars and instructors in academia, technical managers, scientists, engineers, and corporate research and development professionals with backgrounds in chemistry, materials science, polymer chemistry, and physical chemistry.

Tribology of Diamond-like Carbon Films Christophe Donnet,Ali Erdemir,2007-12-06 This book highlights some of the most important structural, chemical, mechanical and tribological characteristics of DLC films. It is particularly dedicated to the fundamental tribological issues that impact the performance and durability of these coatings. The book provides reliable and up-to-date information on available industrial DLC coatings and includes clear definitions and descriptions of various DLC films and their properties.

Diamond-Like Carbon Coatings Peerawatt Nunthavarawong,Sanjay Mavinkere Rangappa,Suchart Siengchin,Kuniaki Dohda,2022-08-08 Diamond-like carbons (DLCs) display a number of attractive properties that make them versatile coating materials for a variety of applications, including extremely high hardness values, very low friction properties, very low gas permeability, good biocompatibility, and very high electrical resistivity, among others. Further research into this material is

required to produce hydrogen-free DLC films and to synthesize it together with other materials, thereby obtaining better film properties. **Diamond-Like Carbon Coatings: Technologies and Applications** examines emerging manufacturing technologies for DLCs with the aim of improving their properties for use in practical applications. Discusses DLC coatings used in mechanical, manufacturing, and medical applications Details recent developments in the novel synthesis of DLC films Covers advances in understanding of chemical, structural, physical, mechanical, and tribological properties for modern material processing Highlights methods to yield longer service life Considers prospects for future applications of emerging DLC technologies This work is aimed at materials science and engineering researchers, advanced students, and industry professionals.

Optically Transparent, Scratch-resistant, Diamond-like Carbon Coatings ,2003 A plasma-based method for the deposition of diamond-like carbon (DLC) coatings is described. The process uses a radio-frequency inductively coupled discharge to generate a plasma at relatively low gas pressures. The deposition process is environmentally friendly and scaleable to large areas, and components that have geometrically complicated surfaces can be processed. The method has been used to deposit adherent 100-400 nm thick DLC coatings on metals, glass, and polymers. These coatings are between three and four times harder than steel and are therefore scratch resistant, and transparent to visible light. Boron and silicon doping of the DLC coatings have produced coatings having improved optical properties and lower coating stress levels, but with slightly lower hardness.

Adherent Diamond Like Carbon Coatings on Metals Via Plasma Source Ion Implantation ,1996 Various techniques are currently used to produce diamond-like carbon (DLC) coatings on various materials. Many of these techniques use metallic interlayers, such as Ti or Si, to improve the adhesion of a DLC coating to a ferrous substrate. An alternative processing route would be to use plasma source ion implantation (PSII) to create a carbon composition gradient in the surface of the ferrous material to serve as the interface for a DLC coating. The need for interlayer deposition is eliminated by using a such a graded interfaces PSII approach has been used to form adherent DLC coatings on magnesium, aluminum, silicon, titanium, chromium, brass, nickel, and tungsten. A PSII process tailored to create a graded interface allows deposition of adherent DLC coatings even on metals that exhibit a positive heat of formation with carbon, such as magnesium, iron, brass and nickel.

Diamond-like-carbon Coatings for Orthopedic Applications Tianzong Xu,1997

Plasma-enhanced Diamond-like Carbon Coatings on Soft Substrates YoungSuk Kim,2022 Diamond-like carbon (DLC) is a form of amorphous carbon that has many attractive properties such as high hardness values, chemical inertness, high electrical breakdown voltage, transparent to visible and infrared light, and strong wear-resistance. These desirable properties give DLC widespread applications. This project explores innovative DLC coatings structures and deposition

technologies to address the needs for protecting soft surfaces. An electrochemical boriding of low carbon steel and subsequent laser arc deposition of DLC were combined to create durable, low friction, low wear, and corrosion-resistant surfaces for harsh environmental conditions. The friction and wear properties of this duplex coating were studied and compared with each corresponding single layer. Finite element modeling of nanoindentation was performed to interpret the optimum thicknesses of the coatings combinations and study the mechanical properties of the duplex system. Corrosion experiments were performed to study the resistance to pinhole defects, as it is a common cause of coating delamination. Fatigue impact tests were conducted to study the resistance against indentation and crack formations. Ultimately, the duplex coating created by boride-carbon hybrid technology showed proof of the concept of low-friction, wear, impact fatigue, and corrosion-resistant in one solution. For the first time, a single beam plasma source was demonstrated for depositing fully transparent DLC coatings at room temperature. The DLC coatings are particularly useful for protecting soft and heat-sensitive surfaces.

Compilation of Diamond-like Carbon Properties for Barriers and Hard Coatings, 1994 Diamond-like carbon (DLC) is an amorphous form of carbon which resembles diamond in its hardness, lubricity, and resistance to chemical attack. Such properties make DLC of interest for use in barrier and hard coating technology. This report examines a variety of properties of DLC coatings. This includes examining substrates on which DLC coatings can be deposited; the resistance of DLC coatings to various chemical agents; adhesion of DLC coatings; and characterization of DLC coatings by electron microscopy, FTIR, sputter depth profiling, stress measurements and nanoindentation.

Lubrication by Diamond and Diamondlike Carbon Coatings, 1997

Nanostructured coatings of diamond-like carbon Corbella-C, 2018-02-28 Diamond-like carbon (DLC) is an amorphous allotrope of carbon showing intermediate electric (graphitic) and mechanical (diamond) properties. DLC thin films are usually prepared by magnetron sputtering and plasma-enhanced chemical vapour deposition. For some applications, it is necessary to deposit DLC coatings with modified properties. One process consists in adding metal atoms into the amorphous DLC matrix. Moreover, the use of pulsed power supplies is becoming dominant in the industrial production of hard coatings. In this work, DLC and metal-DLC films were deposited by pulsed plasma technology and showed modulated surface properties. The production of DLC with modified nanostructure is adequate for applications requiring advanced functionality coatings: cutting tools, sensors and devices, optical systems and biomedical implants assure the versatility of this material.

Engineering Tribology and Materials Yunn Lin Hwang, Jeng Haur Horng, 2017-06-23 ICETAT 2016 Selected, peer reviewed papers from the International Conference on Engineering Tribology and Applied Technology 2016 (ICETAT2016), November 4-6, 2016, Taipei, Taiwan

Advanced Materials and Engineering Structural Technology Mosbeh Kaloop, Jongwon Jung, 2017-04-27 2nd ICAMEST

Selected, peer reviewed papers from the the 2nd International Conference on Advanced Material and Engineering Structural Technology (ICAMEST 2016), November 18-20, 2016, Jeju Island, South-Korea

Terotechnology Agnieszka Szczotok, Jacek Pietraszek, Norbert Radek, Aneta Gądek-Moszczak, 2014-01-08 Selected, peer reviewed papers from the 8th International Conference on Terotechnology, September 26-27, 2013, Kielce, Poland

Residual Stresses IX M. Francois, Guillaume Montay, Benoit Panicaud, Delphine Retraint, Emmanuelle Rouhaud, 2014-08-11 Selected, peer reviewed papers from the 9th European Conference on Residual Stresses, ECRS-9, July 7-10, 2014, Troyes, France

Diamond, Diamond-like Carbon and Related Materials ,2002

Information Engineering for Mechanics and Materials Lin Li Xu, Wen Ya Tian, Elwin Mao, 2011-07-27 Selected, peer reviewed papers from the 2011 International Conference on Information Engineering for Mechanics and Materials (ICIMM 2011), Aug. 13-14, 2011, Shanghai, China

Civil, Materials and Computing Engineering Wen Pei Sung, Jimmy Chih Ming Kao, 2014-12-24 Selected, peer reviewed papers from the 2014 International Conference on Civil, Materials and Computing Engineering (ICCMC 2014), December 6-7, 2014, Taiwan

Mechanical Engineering and Materials Wen Jin, 2012-01-24 ICMEM 2012 Selected, peer reviewed papers from the 2012 International Conference on Mechanical Engineering and Materials (ICMEM 2012), January 15-16, 2012, Melbourne, Australia

Effect of Surface Roughness on Corrosion Resistance and Mechanical Properties of Diamond Like Carbon (DLC) Coating System Mohamed El Tantawy, 2020 Diamond like carbon (DLC) coatings are widely known to have extraordinary chemical and mechanical properties. These properties come from the combination between the graphitic and diamond characteristics that represented chemically by sp² and sp³ hybridization, respectively. The graphitic content yields coating properties of high lubrication and low friction coefficient while the diamond content gives it its high hardness. In addition to the improvement of the mechanical properties, DLC coatings may act as a diffusion barrier which influence the corrosion protection of metallic structures. However, DLC coatings need to be specially designed to avoid the pin holes that exist from most physical vapor deposition processes. The desired DLC coating system is designed to have amorphous carbon in order to avoid grain boundaries that exist with crystalline forms of carbon which often act as corrosion pathways. The DLC coating system was also designed to have an interlayer of titanium which enhances the diffusion barrier properties by disrupting pin holes from the inner to outer DLC layers. The DLC coating system was deposited using direct current (DC) sputtering technique at 200°C as the deposition temperature to avoid forming crystalline carbon which generally forms at higher temperatures. The crystal structures in the DLC coating system were evaluated using X -- ray diffraction (XRD) while,

the graphitic and diamond configurations were assessed using Raman spectroscopy and X -- ray photoelectron spectroscopy (XPS). Raman spectroscopy measurements revealed an overview for the graphitic content in the coating system. The ratio between the intensity of the disordered peak (I(D)) to the graphite peak (I(G)) after subtraction of T peak intensity indicates the degree of disorder from the graphitic configuration in the DLC film. The currently deposited DLC coatings composed of high degree of disorder including a probability of graphenic clusters, polycrystalline graphite and ordered graphene and low probability of sp³ carbon configuration. However, these crystal structures were not observed by X -- ray diffraction. X -- ray photoelectron spectroscopy spectra indicated that the top 10nm layer of the coating was rich in oxygen, and is confirmed by a broadening in XPS C 1st spectra which indicates the existence of carbon in the oxidized form. Also, the first derivative of X -- ray excited Auger Electron Spectroscopy (XAES C KLL) was analyzed and compared with results from P. Me'rels' study. The D value (the energy difference in eV between the major negative-going and positive-going excursion in the first derivative of the XAES spectra) in P. Me'rels' research for diamond was around 14.0 eV and 22.1 eV for graphite. While, the D value for the tested DLC -- Ti coating system appears to be around 20.0 eV and 22.0 eV for highly oriented pyrolytic graphite (HOPG) as graphite reference material (very close to the graphite value in P. Me' rel study). X -- ray diffraction (XRD) used to investigate the crystalline structures exist in the DLC -- Ti coating system. The diffraction pattern of the coating system does not show existence of crystalline graphite and diamond. Also, the XRD pattern confirms the presence of hexagonal-close-packed (hcp) crystalline titanium which also imaged by using scanning electron microscopy. The corrosion resistance of the DLC -- Ti coating system was investigated by the means of cyclic potentiodynamic polarization (CPDP) and potentiodynamic polarization testing in synthetic sea water. CPDP results show that the DLC -- Ti coating system reveals high resistance against the localized pitting corrosion and crevice corrosion. Also, the surface roughness effect on corrosion resistance was studied for uncoated and DLC -- Ti coated 420 stainless steel samples. CPDP curves for uncoated samples show that as the surface roughness value increases, the pitting potential decreases to more active potential hence the pitting corrosion increase. While, the CPDP curves for DLC -- Ti coating system reveal that the coating system act as a good diffusion barrier against the aggressive attacking chloride ions regardless of the surface roughness values of the DLC coating. On the other hand, the corrosion current density values (calculated from Tafel extrapolation of a straight line in the cathodic and anodic regions in potentiodynamic polarization curves) are higher for coated DLC -- Ti specimens than the uncoated 420 stainless steel. The mechanical properties of DLC -- Ti coating system were studied in terms of hardness (by the means of nanoindentation), friction and wear resistance (by using tribometer facility). The load -- displacement curves of nanoindentation tests of the DLC -- Ti coating system show a mean hardness of 4.55 GPa and 78.12 GPa as a mean elastic modulus, the mean contact depth was approximately 142 nm. The surface roughness value of the smoothest DLC -- Ti coating system was 10 nm which is considered to be high. The surface roughness of the coating has a scattering effect on the

measured values of hardness and residual elastic modulus so 16 indents were performed on a 15 [mu]m by 15 [mu]m square area with a fixed 5 [mu]m spacing between each indent to reduce this scattering effect. Tribological evaluation was performed for uncoated 420 stainless steel samples in dry and wet environment using 6 mm and 4 mm spinning radius for 7 surface roughness values from 0.065 [mu]m to 0.003 [mu]m, the same was performed for DLC -- Ti coating system as a function of 6 surface roughness values ranging from 0.061 [mu]m to 0.010 [mu]m. The results were used to assess the friction resistance and the wear resistance of the DLC -- Ti coating system. For uncoated samples, in dry environment, the mean friction coefficient values decrease as the surface roughness value decreases for both 4 mm and 6 mm spinning diameter. In wet environment, the friction coefficient values show the same trend as a function of surface roughness in both 4 mm and 6 mm spinning radius. For DLC -- Ti coating system, in dry environment, for 6 mm and 4 mm spinning radius, the friction coefficient values show identical trend as a function of surface roughness. No distinct relationship between the surface roughness of the coating system and the friction coefficient was observed in this study. In wet environment, the friction coefficient values show the same trend as a function of surface roughness in both 4 mm and 6 mm spinning radius. Finally, the friction coefficient values of uncoated 420 stainless steel and DLC -- Ti coated samples show that the coating system reveals high friction resistance in comparison with the uncoated samples which is desirable for the wear resistance. The wear resistance of the DLC -- Ti coating system on 420 stainless-steel substrates was investigated in terms of wear volume. The wear volume is considered to be a cylindrical ellipsoid where the volume was calculated based on wear path geometry. The wear resistance efficiency of the coating system was represented as the added percent improvement. For 6 mm spinning radius, the DLC -- Ti coating system shows higher percent of improvement in dry conditions (99.7%) in comparison with the wet conditions (81.7%). The same was in case of 4 mm spinning radius, the DLC -- Ti coating system provides a higher percent of improvement in dry conditions (99.8%) in comparison with the wet conditions (87.3%). Also, the wear volume calculations did not show a specific trend as a function of surface roughness for uncoated 420 stainless steel and DLC -- Ti coated samples in all conditions.

Continuous Nanophase and Nanostructured Materials: Volume 788 Sridhar Komarneni, John C. Parker, John Calvin Parker, James J. Watkins, 2003 This book focuses on recent advances in nanostructured and nanophase materials and their applications. Nanostructured materials consist of domains of less than 100nm and include atom clusters and cluster assemblies, one- and two-dimensionally modulated layers and three-dimensional structures. The term 'nanophase' refers to structures comprised of domains or particles of a single material that are typically less than 100nm, whereas 'nanocomposite' refers to a composite of more than one nanophase. Nanoscale materials can be engineered as homogeneous or porous ceramics, metals, metal oxides, semiconductors, organic polymers, or as composite materials containing these components. This book brings together scientists from many disciplines to share and discuss advances in the field. Topics include:

nanophase materials; nanocomposite materials; nanoporous materials; nanostructured materials; applications and properties of nanostructured materials; carbon nanotubes; nanostructured thin films and coatings; and theoretical and modeling studies of nanostructured materials.

The Enigmatic Realm of **Diamond Like Carbon Dlc Coating**: Unleashing the Language is Inner Magic

In a fast-paced digital era where connections and knowledge intertwine, the enigmatic realm of language reveals its inherent magic. Its capacity to stir emotions, ignite contemplation, and catalyze profound transformations is nothing in short supply of extraordinary. Within the captivating pages of **Diamond Like Carbon Dlc Coating** a literary masterpiece penned by way of a renowned author, readers embark on a transformative journey, unlocking the secrets and untapped potential embedded within each word. In this evaluation, we shall explore the book's core themes, assess its distinct writing style, and delve into its lasting affect the hearts and minds of those who partake in its reading experience.

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