Adhesion and Adhesives: Fundamental and Applied Aspects

# Atmospheric Pressure Plasma Treatment of Polymers

Relevance to Adhesion

Edited by Michael Thomas and K.L. Mittal



# <u>Atmospheric Pressure Plasma Treatment Of Polymers</u> <u>Relevance To Adhesion</u>

J. Leon Shohet

#### **Atmospheric Pressure Plasma Treatment Of Polymers Relevance To Adhesion:**

Atmospheric Pressure Plasma Treatment of Polymers Michael Thomas, K. L. Mittal, 2013-06-19 An indispensable volume detailing the current and potential applications of atmospheric pressure plasma treatment by experts practicing in fields around the world Polymers are used in a wide variety of industries to fabricate legions of products because of their many desirable traits However polymers in general and polyolefins in particular are innately not very adhesionable because of the absence of polar or reactive groups on their surfaces and concomitant low surface energy Surface treatment of polymers however is essential to impart reactive chemical groups on their surfaces to enhance their adhesion characteristic Proper surface treatment can endow polymers with improved adhesion without affecting the bulk properties A plethora of techniques ranging from wet to dry simple to sophisticated vacuum to non vacuum for polymer surface modification have been documented in the literature but the Atmospheric Pressure Plasma APP treatment has attracted much attention because it offers many advantages vis a vis other techniques namely uniform treatment continuous operation no need for vacuum simplicity low cost no environmental or disposal concern and applicability to large area samples Although the emphasis in this book is on the utility of APP treatment for enhancement of polymer adhesion APP is also applicable and effective to modulate many other surface properties of polymers superhydrophilicity superhydrophobicity anti fouling anti fogging anti icing cell adhesion biocompatibility tribological behavior etc The key features of Atmospheric Pressure Plasma Treatment of Polymers Address design and functions of various types of reactors Bring out current and potential applications of APP treatment Represent the cumulative wisdom of many key academic and industry researchers actively engaged in this key and enabling technology Polymer Surface Modification: Relevance to Adhesion, Volume 4 Kash L. Mittal, 2007-05-11 This book documents the proceedings of the Fifth International Symposium on this topic held in Toronto The book is divided into two parts Part 1 Surface Modification Techniques Part 2 Adhesion Improvement to Polymer Surfaces Various ways to modify a host of polymer surfaces for a variety of purposes are covered in this book with emphasis on

Progress in Adhesion and Adhesives, Volume 6 K. L. Mittal, 2021-08-24 With the voluminous research being published it is difficult if not impossible to stay abreast of current developments in a given area. The review articles in this book consolidate information to provide an alternative way to follow the latest research activity and developments in adhesion science and adhesives. With the ever increasing amount of research being published it is a Herculean task to be fully conversant with the latest research developments in any field and the arena of adhesion and adhesives is no exception. Thus topical review articles provide an alternate and very efficient way to stay abreast of the state of the art in many subjects representing the field of adhesion science and adhesives. The 19 chapters in this Volume 6 follow the same order as the review articles originally published in RAA in the year 2020 and up to June 2021. The subjects of these 19 chapters fall in the following areas. Adhesives and adhesive joints Contact angle Reinforced polymer composites Bioadhesives Icephobic coatings Adhesives.

based on natural resources Polymer surface modification Superhydrophobic surfaces The topics covered include hot melt adhesives adhesively bonded spar wingskin joints contact angle hysteresis fiber matrix adhesion in reinforced thermoplastic composites bioadhesives in biomedical applications mucoadhesive pellets for drug delivery applications bio inspired icephobic coatings wood adhesives based on natural resources adhesion in biocomposites vacuum UV surface photo oxidation of polymers and other materials vitrimers and their relevance to adhesives superhydrophobic surfaces by microtexturing structural acrylic adhesives mechanically durable water repellent surfaces mussel inspired underwater adhesives and cold atmospheric pressure plasma technology for modifying polymers Audience This book will be valuable and useful to researchers and technologists in materials science nanotechnology physics surface and colloid chemistry in multiple disciplines in academia industry various research institutes and other organizations Plasma Surface Modification of *Polymers: Relevance to Adhesion* Kash L. Mittal, M., Lyons, 2014-04-29 This book is a collection of invited papers previously published in special issues of the Journal of Adhesion Science and Technology written by internationally recognized researchers actively working in the field of plasma surface modification It provides a current comprehensive overview of the plasma treatment of polymers In contrast to plasm Polymer Surface Modification to Enhance Adhesion K. L. Mittal, Anil N. Netravali, 2024-03-01 POLYMER SURFACE MODIFICATION TO ENHANCE ADHESION This unique comprehensive and groundbreaking book is the first on this important subject Polymer Surface Modification to Enhance Adhesion comprises 13 chapters and is divided into two parts Part 1 Energetic Treatments and Part 2 Chemical Treatments Topics covered include atmospheric pressure plasma treatment of polymers to enhance adhesion corona treatment of polymer surfaces to enhance adhesion flame surface treatment of polymers to enhance adhesion vacuum UV photo oxidation of polymer surfaces to enhance adhesion optimization of adhesion of polymers using photochemical surface modification UV Ozone surface treatment of polymers to enhance adhesion adhesion enhancement of polymer surfaces by ion beam treatment polymer surface modification by charged particles laser surface modification of polymeric materials competition in adhesion between polysort and monosort functionalized polyolefinic surfaces amine terminated dendritic materials for polymer surface modification arginine glycine aspartic acid RGD modification of polymer surfaces and adhesion promoters for polymer surfaces Audience The book will be of great interest to polymer scientists surface scientists adhesionists materials scientists plastics engineers and to those involved in adhesive bonding packaging printing painting metallization biological adhesion biomedical devices and polymer composites Progress in Adhesion and Adhesives, Volume 9 K. L. Mittal, 2025-04-29 The present book constitutes Volume 9 in the book series Progress in Adhesion and Adhesives which was conceived as an annual publication and the premier volume made its debut in 2015 These volumes provide state of the knowledge and curated reviews on many and varied topics about adhesion and adhesives The current book contains 14 chapters that include the use of hydrophobic and icephobic coatings for aircraft icing mitigations fundamental concepts and the application of hydrophobic

coatings plasma treatment of polymers to enhance their adhesion atmospheric pressure plasma treatment of artificial leather sustainable plasma technology as a surface treatment in footwear materials failure cases in adhesive joints and coatings initiating systems for curing anaerobic adhesives use of fungal mycelia as an adhesive in composites mechanically responsive hydrogels as adhesives for clinical applications and adhesion of electrode coatings in lithium ion batteries and Progress in Adhesion and Adhesives, Volume 7 K. L. Mittal, 2023-12-27 The current book contains eight commissioned chapters and cover topics including stress distribution and design analysis of adhesively bonded tubular composite joints durability of structural adhesive joints mechanical surface treatment of adherends for adhesive bonding surface modification of polymer materials by excimer UV light corona discharge treatment of materials to enhance adhesion adhesion activation of aramid fibers dual cured hydrogels for bioadhesives and biomedical applications and non adhesive Polymer Surface Modification: Relevance to Adhesion, Volume 2 Kash L. Mittal, 2023-01-06 SLIPS like surfaces This book chronicles the proceedings of the Second International Symposium on Polymer Surface Modification Relevance to Adhesion held Newark New Jersey May 24 26 1999 Polymeric materials are intrinsically not very adhesionable and this necessitates their surface treatment to enhance their adhesion characteristics to other materials Since the first symposium on this topic held in 1993 there has been a tremendous R Part 2 Other Miscellaneous Surface Modification Techniques and Part 3 General Papers The topics covered include plasma surface modification of a variety of polymers using various plasma gases atmospheric plasma system surface functionalization ultrahydrophobic polymeric surfaces metallization of plasma treated polymers surface modification of polymers via molecular design for adhesion promotion wet chemical methods for polymer surface modification laser surface modification of various polymers UV ozone treatment surface and interface studies of treated polymer surfaces by an array of techniques bioadhesion of polymeric biomaterials to tissue polymer fiber systems and plasma deposited coatings Plasma Applications In Gases, Liquids And Solids: Technology And Methods Claudia Riccardi, H Eduardo Roman, 2023-09-21 This book explores the exciting and evolving world of plasma physics in materials manufacturing and processing From ionized discharges to non thermal equilibrium plasmas new phenomena in physics are constantly emerging Written organized and edited by internationally recognized experts the various chapters delve into diverse issues in plasma science including new applications at the nanoscale to the development of diagnostic tools and simulations The interactions between the plasma state and matter both surface and bulk as well as gases and liquids are explored As electric discharges in plasmas continue to expand towards new horizons anyone interested in this fascinating field would benefit from this book as an up to date and essential resource Plasma Modification of Polyolefins N. S. Baneesh, P. S. Sari, Tatana Vackova, Sabu Thomas, 2021-11-22 This book addresses plasma modification of polyolefin surfaces It comprises 21 chapters divided into three major sections The first section covers the different techniques used for plasma modification of polyolefin surfaces and the effects of various gases as a surrounding medium while the second provides a

detailed analysis of the physics and chemistry of plasma modification and discusses various innovative characterization techniques as well as ageing of the modified surface It focuses on the analysis of changes in polymers surface chemistry using various spectroscopic techniques and of changes in their surface morphology after plasma treatment using optical microscopy electron microscopy and atomic force microscopy In addition it provides detailed information on the characterization of modified polymer surfaces The book s third and last section covers a range of applications of plasma modified polyolefin surfaces varying from the packaging industry to the biomedical field and shares valuable insights on the lifecycle analysis of plasma modification and modified surfaces Non-Thermal Processing of Functional Foods Sudip Kumar Pattanayek, Debashis Dutta, Ajay Singh, 2024-12-31 Functional foods also known as nutraceuticals began to gain prominence in the 1980s in Japan as foods for specified health use and became more widely recognized in the 1990s as research and interest in foods that could provide specific health benefits beyond essential nutrition grew worldwide These foods are typically enriched with bioactive components or formulated to contain substances or live microorganisms with a possible health enhancing or disease preventing value and at a safe and sufficiently high concentration to achieve the intended benefit Usually the added ingredients are classified as nutrients dietary fiber phytochemicals other substances or probiotics The production storage and consumer consumption of these functional foods require special attention to preserve quality attributes The production process of these foods can be classified as conventionally used thermal processing methods and non thermal alternatives In addition these processes may be combined with biological approaches involving enzymatic treatment and fermentation The various non thermal processes such as ultrasounds high hydrostatic pressure vacuum impregnation high voltage electrical discharge cold plasma pulsed light ozonation etc can be utilized for a product to sustain preserve quality attributes of the ingredients long shelf life and sensory qualities This book compiles the latest non thermal processing technologies to develop functional foods The book discusses bioactivity bioaccessibility and bioavailability related to nutrition and functional food ingredients It has 16 articles on different aspects of non thermal processing technologies Chapter 1 has discussed a general overview of emerging technologies and various non thermal processing techniques are discussed in Chapters 2 6 8 9 and 12 Chapters 7 11 13 15 and 16 discuss food safety and preservation We have discussed the functional foods and bioactive compounds in Chapters 10 and 14 A few of these reviews discuss the impact of developing non thermal technologies on several food components proteins carbohydrates lipids minerals vitamins polyphenols glucosinolates fragrance compounds and enzymes while maintaining the structure and functional properties This book is an excellent source of information for professionals postgraduate students and researchers in food sciences and chemical engineering

**Adhesion to Fluoropolymers** Derek Brewis, Ralf H. Dahm, 2006 **Advances in Structural Adhesive Bonding** David A. Dillard, 2023-06-10 Advances in Structural Adhesive Bonding Second Edition reviews developments in adhesive bonding for a range of advanced structural engineering applications This new edition has been fully revised to include the latest

advances in materials testing and modeling methods lifecycle considerations and industrial implementation Sections review advances in commonly used groups of structural adhesives covering epoxy acrylic anaerobic and cyanoacrylate polyurethane and silicone adhesives along with toughening Other chapters cover various types of adherends and pre treatment methods for structural materials including metals plastics composites wood and joint design and testing including topics such as fracture mechanics life prediction techniques and advanced testing methods. This is a valuable guide for all those working with structural adhesives including those in an industrial setting adhesive specialists structural engineers design engineers R D professionals and scientists as well as academic researchers and advanced students in adhesives joining technology materials science and mechanical engineering Provides detailed coverage on the main adhesive groups including epoxy acrylic cyanoacrylate polyurethane and silicone adhesives Includes the latest developments across adherends pre treatment methods joint design and testing durability and lifecycle related issues Addresses environmental challenges adhesive specification quality control and risk mitigation for specific industrial application areas **Textile Finishing** K. L. Mittal, Thomas Bahners, 2017-08-24 The book details the recent and exciting developments on various fronts in the textile field with regard to novel and innovative functionalities as well as their applications in various industries Technical textiles are used in various industries for a host of purposes and applications Recent developments in novel and innovative functionalities to textiles include easy to clean or dirt repellent flame retardancy anti bacterial and fog harvesting properties Textiles for electronics based on graphene CNTs and other nanomaterials conductive textiles textiles for sensor function textile fixed catalysts textiles for batteries and energy storage textiles as substrates for tissue engineering and textiles for O W separation are prevalent as well All this development has been made possible through adopting novel ways for finishing textiles e g by appropriate surface modification techniques and utilizing biomimetic concepts borrowed from nature This unique book is divided into four parts Part 1 Recent Developments Current Challenges in Textile Finishing Part 2 Surface Modification Techniques for Textiles Part 3 Innovative Functionalities of Textiles Part 4 Fiber Reinforced Composites The topics covered include Antimicrobial textile finishes flame retardant textile finishing self cleaning or easy to clean textiles metallization of textiles atmospheric pressure plasma and UV based photochemical surface modification of textiles tunable wettability of textiles 3D textile structures for fog harvesting textile fixed catalysts medical textiles as substrates for tissue engineering and fiber reinforced green or greener biocomposites and the relevance of fiber matrix adhesion

Encyclopedia of Plasma Technology - Two Volume Set J. Leon Shohet,2016-12-12 Technical plasmas have a wide range of industrial applications. The Encyclopedia of Plasma Technology covers all aspects of plasma technology from the fundamentals to a range of applications across a large number of industries and disciplines Topics covered include nanotechnology solar cell technology biomedical and clinical applications electronic materials sustainability and clean technologies. The book bridges materials science industrial chemistry physics and engineering making it a must have for

researchers in industry and academia as well as those working on application oriented plasma technologies Also Available Online This Taylor E mail e reference taylorandfrancis com International Tel 44 0 20 7017 6062 E mail online sales tandf co Surface & Coatings Technology B. D. Sartwell, A. Matthews, 2016-06-03 Surface Coatings Technology Volumes 59 60 presents the proceedings of the Third International Conference on Plasma Surface Engineering held in Garmisch Partenkirchen Germany on October 26 29 1992 This book discusses the widespread applications of plasma and particle beam assisted methods in surface and thin film technology Volume 59 is organized into 11 parts encompassing 69 chapters while Volume 60 is comprised of eight parts encompassing 49 chapters This compilation of papers begins with an overview of the kinetic modelling of low pressure high frequency discharges This text then examines the effect of various deposition parameters on the growth of chamber wall deposits Other chapters consider the physiochemical behavior of ceramic materials for space applications This book discusses as well the economic aspects of the application of plasma surface technologies. The reader is also introduced to the environmental aspects of physical vapor deposition coating technology. This book is a valuable resource for plasma surface engineers technologists and researchers Comprehensive Materials Processing, 2014-04-07 Comprehensive Materials Processing Thirteen Volume Set provides students and professionals with a one stop resource consolidating and enhancing the literature of the materials processing and manufacturing universe It provides authoritative analysis of all processes technologies and techniques for converting industrial materials from a raw state into finished parts or products Assisting scientists and engineers in the selection design and use of materials whether in the lab or in industry it matches the adaptive complexity of emergent materials and processing technologies Extensive traditional article level academic discussion of core theories and applications is supplemented by applied case studies and advanced multimedia features Coverage encompasses the general categories of solidification powder deposition and deformation processing and includes discussion on plant and tool design analysis and characterization of processing techniques high temperatures studies and the influence of process scale on component characteristics and behavior Authored and reviewed by world class academic and industrial specialists in each subject field Practical tools such as integrated case studies user defined process schemata and multimedia modeling and functionality Maximizes research efficiency by collating the most important and established information in one place with integrated applets linking to relevant **Metal-Polymer Systems** Jörg Florian Friedrich, 2017-12-04 The result of decades of research by a outside sources pioneer in the field this is the first book to deal exclusively with achieving high performance metal polymer composites by chemical bonding Covering both the academic and practical aspects the author focuses on the chemistry of interfaces between metals and polymers with a particular emphasis on the chemical bonding between the different materials He elucidates the various approaches to obtaining a stable interface including but not limited to thermodynamically driven redox reactions bond protection to prevent hydrolysis the introduction of barrier layers and stabilization by spacer molecules

Throughout chemical bonding is promoted as a simple and economically viable alternative to adhesion based on reversible weak physical interaction Consequently the text equips readers with the practical tools necessary for designing high strength metal polymer composites with such desired properties as resilience flexibility rigidity or degradation resistance **Technology for Hyperfunctional Surfaces** Hubert Rauscher, Massimo Perucca, Guy Buyle, 2010-04-16 Based on a project backed by the European Union this is a must have resource for researchers in industry and academia concerned with application oriented plasma technology research Clearly divided in three sections the first part is dedicated to the fundamentals of plasma and offers information about scientific and theoretical plasma topics plasma production surface treatment process and characterization. The second section focuses on technological aspects and plasma process applications in textile food packaging and biomedical sectors while the final part is devoted to concerns about the environmental sustainability of plasma processes Polymer Biointerfaces Marián Lehocký ,Petr Humpolíček,2020-12-02 Dear Colleagues Polymer biointerfaces are considered a suitable alternative to the improvement and development of numerous applications The optimization of polymer surface properties can control several biological processes such as cell adhesion proliferation viability and enhanced extracellular matrix secretion functions at biointerfaces This printed Special Issue on Polymer Biointerfaces is focused on fundamental and applied research on polymers and systems with biological origin Submissions contain both polymer material background and descriptions of interacting biological phenomena or relevance to prospective applications in biomedical biochemical biophysical biotechnological food pharmaceutical or cosmetic fields Special attention has been given to polymer bio surface modification bio coatings cell polymer surface interactions self assembling monolayers on polymers in vivo and in vitro systems protein polymer surface interaction polysaccharide polymer interactions biotribology bio chip biosensors nano bio interfaces coatings biofilms adhesion phenomena and molecular recognition among others Assoc Prof Mari n Lehock Assoc Prof Petr Humpol ekGuest Editors

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