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Hydrogen Bonded Polymers Fusion Bonding of Polymer Composites Complex Macromolecular Architectures Advances in Shape Memory Polymers Advanced Polymer Composites and Polymers in the Civil Infrastructure Polymer Bonding 2004 Single-Chain Polymer Nanoparticles Advances in Sustainable Polymers Advances in Polymer Friction and Wear Advanced Fibre-Reinforced Polymer (FRP) Composites for Structural Applications Recent Advances in the Field of Crystallization and Fusion of Polymers Advanced fibre-reinforced polymer (FRP) composites for structural applications Advanced Polymer Composites for Structural Applications in Construction Advanced fibre-reinforced polymer (FRP) composites for structural applications Advanced Polymer Composites for Structural Applications in Construction Polymers and Other Advanced Materials Supramolecular Polymer Networks and Gels Advanced fibre-reinforced polymer (FRP) composites for structural applications Science and Technology of Polymers and Advanced Materials Science and Technology of Polymers and Advanced Materials Fusion Bonding of Polymer Composites Advanced Polymers in Medicine Polymer-Engineered Nanostructures for Advanced Energy Applications Advanced Functional Polymers for Biomedical Applications Hydrogen Bonding in Polymeric Materials Near Infrared Photon-assisted Polymerization of Advanced Polymer Composites Recent Advances in Smart Self-Healing Polymers and Composites Advanced fibre-reinforced polymer (FRP) composites for structural applications Handbook of Advanced Electronic and Photonic Materials and Devices, Ten-Volume Set Advances in New Materials Polymer Nanocomposites for Advanced Engineering and Military Applications Shape Memory Polymers Bonding Elastomers Advances in Polymers for Biomedical Applications Joining of Polymer-Metal Hybrid Structures Fundamentals and Recent Advances in Nanocomposites Based on Polymers and Nanocellulose Advanced fibre-reinforced polymer (FRP) composites for structural applications Advances in Polymer Coated Textiles Advances in Polymeric Systems for Drug Delivery Developments in Fiber-Reinforced Polymer (FRP) Composites for Civil Engineering

Advanced Functional Polymers for Biomedical Applications Feb 26 2021 Advanced Functional Polymers for Biomedical Applications presents novel techniques for the preparation and characterization of functionalized polymers, enabling researchers, scientists and engineers to understand and utilize their enhanced functionality in a range of cutting-edge biomedical applications. Provides systematic coverage of the major types of functional polymers, discussing their properties, preparation techniques and potential applications Presents new synthetic approaches alongside the very latest polymer processing and characterization methods Unlocks the potential of functional polymers to support ground-breaking techniques for drug and gene delivery, diagnostics, tissue engineering and regenerative medicine

Near Infrared Photon-assisted Polymerization of Advanced Polymer Composites Dec 27 2020 Advanced composites play important roles in the materials sciences, military, space and commercial applications. The desirable load transfer and mechanical strength of reinforced polymers are crucial for developing advanced composites. Owing to their excellent mechanical properties derived from the sp2 bonding structure and the nanoscale size, nano-carbons are attractive materials used for nanoscale reinforcement of polymer composites. This dissertation describes a novel method to develop polymer composites using near infrared (NIR) photon-assisted polymerization and nanoscale reinforcement. We used multi-walled carbon nanotubes (MWNTs), reduced graphene oxide (RGO), and graphene nanoplatelets (GNPs) to make polymer composites, and explored in-situ NIR photon assisted heating of these nano carbons to enhance polymerization of the nano-carbon/polymer interface, thus achieving significant load transfer and improved mechanical properties. To specify, nano-carbon was dispersed into the polymer matrix by shear or evaporation mixing method to attain a uniform distribution in the prepared thin film composite. The thin film was exposed to NIR light during polymerization instead of conventional oven based heating. NIR was effectively absorbed by nano-carbons and also atoms from polymer molecule; the induced photo-thermal heat was transferred into the polymer matrix to induce polymerization of the composite and the covalent bonding between nano-carbons and polymer matrix at the interface. Scanning electron microscope (SEM), Raman spectroscopy, and RSA were used to evaluate the load transfer and mechanical strength of the polymerized composite samples. Investigating first the nanotube/polymer composites synergized by NIR photon-assisted polymerization, large Raman shifts (20 cm-1 wavenumber for up to 80% strains) of the 2D band were recorded for the NIR light polymerized samples and an increase in Young's modulus by ~130% was measured for the 1 wt. MWNT/poly(dimethylsiloxane) (PDMS) composites. While at first it was thought that NIR radiation during polymerization heated the nano-carbons inside resulting in strengthening of the nano-carbon/polymer interface, it was seen after further experimentation with graphene reinforcements that other light induced bonding effects apart from heat were also responsible. Raman spectroscopy revealed that mixing graphene in polymer has a profound effect on the G, D and 2D bands. Investigating G bands for pure RGO and GNPs and comparing them with their polymer counterparts showed large shifts in the G band indicating lattice compression. The comparison of the NIR polymerization with the conventional oven based polymerization for both RGO and GNPs revealed large changes in wavenumbers and indicated increased load transfers for the NIR photon-assisted polymerization method. The Full Width Half Maximum (FWHM) data of the NIR treated samples exhibited smaller change at large strains compared to conventionally polymerized samples indicating the minimum slippage in the former. Finally, the stress-strain curves showed more than three times improvement in the Young's modulus of the composites fabricated using the NIR treatment in comparison to the conventional baking for both types of graphene. These results are compared to the carbon nanotube (CNT) counterparts in PDMS. The study provided insights on how to use stress-sensitive shifts in Raman spectroscopy for the development of advanced polymer composites. While NIR light induced polymerization showed increased load transfer and mechanical strength of nanotube and graphene polymer composites, investigation into two types of nano-carbon of different dimensionalities yielded extraordinary synergy between nano-carbons. Synergistic effects in binary mixtures of nano-carbon/polymer composites polymerized by NIR photon-assisted polymerization are observed. Small amounts of MWNT0.1 dispersed in RGO0.9/PDMS samples (subscripts represent weight percentage) reversed the sign of the Raman stress-

sensitive wavenumbers from positive to negative values demonstrating the reversal of the lattice stress itself on applied uniaxial strain. A wavenumber change from 10 cm-1 in compression to 10 cm-1 in tension, and an increase in the Young's modulus of ~103% was observed for the MWNT0.1RGO0:9/PDMS with applied uniaxial tension. Extensive scanning electron microscopy measurement revealed the bridging of MWNT between two graphene plates in polymer composites. Mixing small amounts of MWNTs in RGO/PDMS eliminated the previously reported compressive deformation of RGO and significantly enhanced the load transfer and the mechanical strength of composites in tension. This is a direct indication of the cooperative effects of binary nano-carbons that produces an overall dramatic increase in load transfer (100% change). The orientation order of MWNTs with the application of uniaxial tensile strain directly affected the shift in the Raman wavenumbers (2D-band and G-band) and the load transfer. It is observed that the cooperative behavior of binary nano-carbons in polymer composites resulted in enhanced load transfer and mechanical strength. Such binary compositions could be fundamentally interesting for developing advanced composites such as nano-carbon based mixed dimensional systems. The NIR polymerization could be used to control aspects such as polymer chain entanglement between nano-carbons of different dimensional states, polymer chain lengths, mobility and eventual mechanical and electrical properties. At first it was thought that NIR light based polymerization only heated the nano-carbons and strengthened the interface, further studies using X-ray photoelectron spectroscopy (XPS) suggested other light induced bond formation was also responsible mechanism for improved interfacial strength, load transfer and mechanical properties. XPS data on RGO/polymer composites suggested activation of hydroxyl and carbonyl groups on the RGO that opens the carbon-carbon double bond of the PDMS oligomer thereby assisting in the formation of the C-O bonds between the PDMS matrix and the graphene filler. High absorption of NIR photons causes the free radical reaction between SiH group on PDMS crosslinker and hydroxyl/carbonyl groups on the RGO. The increase in the number of C-O and Si-O bonds at the graphene/polymer interface assists in the improved load transfer and eventual mechanical properties of the composites. This is the first such study which shows direct correlation between bond formation, load transfer and mechanical properties without degrading the interface. While surface chemical functionalization is attractive, past reports have shown that improvement in interfacial adhesion due to surface functionalization of nanotubes does not always promote improvement in mechanical properties. This is due to the surface degradation of nanotubes/graphene during functionalization process. Compared to these techniques, the NIR light induced technique is benign, environmentally friendly and also results in high interfacial shear strength, load transfer and excellent mechanical properties. As a demonstration of applications, PDMS/RGO/PDMS sandwiched structure strain sensor, a demo application of the NIR photon-assisted polymerization was investigated. High sensitivity and high Gauge Factor (GF) are addressed. These results shown in this dissertation suggest that the NIR photon-assisted polymerization can be practically developed as a scalable nanomanufacturing technique to create large panels of advanced composites with strong interface and better mechanical properties compared to conventional oven based heating methods. It also suggests that it is possible to fabricate large-scale flexible smart device like high sensitivity strain sensors.

Single-Chain Polymer Nanoparticles Aug 15 2022 This first book on this important and emerging topic presents an overview of the very latest results obtained in single-chain polymer nanoparticles obtained by folding synthetic single polymer chains, painting a complete picture from synthesis via characterization to everyday applications. The initial chapters describe the synthetics methods as well as the molecular simulation of these nanoparticles, while subsequent chapters discuss the analytical techniques that are applied to characterize them, including size and structural characterization as well as scattering techniques. The final chapters are then devoted to the practical applications in nanomedicine, sensing, catalysis and several other uses, concluding with a look at the future for such nanoparticles. Essential reading for polymer and materials scientists, materials engineers, biochemists as well as environmental chemists.

Polymer-Engineered Nanostructures for Advanced Energy Applications Mar 30 2021 This book provides a comprehensive overview of engineering nanostructures mediated by functional polymers in combination with optimal synthesis and processing techniques. The focus is on polymer-engineered nanostructures for advanced energy applications. It discusses a variety of polymers that function as precursors, templates, nano-reactors, surfactants, stabilizers, modifiers, dopants, and spacers for directing self-assembly, assisting organization, and templating growth of numerous diverse nanostructures. It also presents a wide range of polymer processing techniques that enable the efficient design and optimal fabrication of nanostructured polymers, inorganics, and organic–inorganic nanocomposites using in-situ hybridization and/or ex-situ recombination methodologies. Combining state-of-the-art knowledge from polymer-guided fabrication of advanced nanostructures and their unique properties, it especially highlights the new, cutting-edge breakthroughs, future horizons, and insights into such nanostructured materials in applications such as photovoltaics, fuel cells, thermoelectrics, piezoelectrics, ferroelectrics, batteries, supercapacitors, photocatalysis, and hydrogen generation and storage. It offers an instructive and approachable guide to polymer-engineered nanostructures for further development of advanced energy materials to meet ever-increasing global energy demands. Interdisciplinary and broad perspectives from internationally respected contributors ensure this book serves as a valuable reference source for scientists, students, and engineers working in polymer science, renewable energy materials, materials engineering, chemistry, physics, surface/interface science, and nanotechnology. It is also suitable as a textbook for universities, institutes, and industrial institutions.

Handbook of Advanced Electronic and Photonic Materials and Devices, Ten-Volume Set Sep 23 2020 Vol. 1: Semiconductors;Vol. 2: Semiconductors Devices;Vol. 3: High-Tc Superconductors and Organic Conductors; Vol. 4: Ferroelectrics and Dielectrics; Vol. 5: Chalcogenide Glasses and Sol-Gel Materials; Vol. 6 Nanostructured Materials; Vol. 7: Liquid Crystals, Display and Laser Materials; Vol. 8: Conducting Polymers; Vol. 9: Nonlinear Optical Materials; Volume 10: Light-Emitting Diodes, Lithium Batteries and Polymer Devices

Hydrogen Bonded Polymers Feb 21 2023 Control of polymeric structure is among the most important endeavours of modern macromolecular science. In particular, tailoring the positioning and strength of intermolecular forces within macromolecules by synthetic methods and thus gaining structural control over the final polymeric materials has become feasible, resulting in the field of supramolecular polymer science. Besides other intermolecular forces, hydrogen bonds are unique intermolecular forces enabling the tuning of material properties via self-assembly processes over a wide range of interactions strength ranging from several kJmol to several tens of kJmol . Central for the formation of these structures are precursor molecules of small molecular weight (usually lower than 10 000), which can assemble in solid or solution to aggregates of defined geometry.

Recent Advances in the Field of Crystallization and Fusion of Polymers Apr 11 2022
Fundamentals and Recent Advances in Nanocomposites Based on Polymers and Nanocellulose Feb 15 2020 Fundamentals and Recent Advances in Nanocomposites Based on Polymers and Nanocellulose brings together the latest research in cellulose-based nanocomposites, covering fundamentals, processing, properties, performance, applications, and the state of the art. The book begins by explaining the fundamentals of cellulose and cellulose-based nanocomposites, including sources, extraction, types, classification, linkages, model structure, model compounds, and characterization techniques. The second part of the book covers the incorporation of cellulose fillers to improve the properties or characteristics of nanocomposites, organized by composite category, including in aerogels, thermoplastic composites, thermoset composites, bioplastic composites, carbon nanofibers, rubber composites, carbon fibers, and foaming materials. Throughout these chapters, there is an emphasis on the latest innovations and application potential. Finally, applications are explored in more detail, notably focusing on the utilization of nanocellulose in biodegradable composites for biomedical applications, along with other important industrial application areas. This book is of great interest to researchers, scientists, and advanced students working with bio-based materials, and across polymer science, nanomaterials, composite materials, plastics engineering, chemical engineering, materials science and engineering, as well as R&D professionals, engineers, and industrialists interested in the development of bio-based materials for advanced applications or material commercialization. Presents the fundamentals of cellulose-based nanocomposites, including sources, extraction, types, classification, linkages, structure, compounds, and characterization. Discusses and analyzes the most suitable fabrication methods and processing techniques for cellulose as a reinforcement in a range of composites. Opens the door to a range of cutting-edge applications and considers key aspects such as cost, lifecycle, and biodegradability.
Supramolecular Polymer Networks and Gels Oct 05 2021 The series Advances in Polymer Science presents critical reviews of the present and future trends in polymer and biopolymer science. It covers all areas of research in polymer and biopolymer science including chemistry, physical chemistry, physics, material science. The thematic volumes are addressed to scientists, whether at universities or in industry, who wish to keep abreast of the important advances in the covered topics. Advances in Polymer Science enjoys a longstanding tradition and good reputation in its community. Each volume is dedicated to a current topic and each review critically surveys one aspect of that topic, to place it within the context of the volume. The volumes typically summarize the significant developments of the last 5 to 10 years and discuss them critically, presenting selected examples, explaining and illustrating the important principles and bringing together many important references of primary literature. On that basis, future research directions in the area can be discussed. Advances in Polymer Science volumes thus are important references for every polymer scientist, as well as for other scientists interested in polymer science - as an introduction to a neighboring field, or as a compilation of detailed information for the specialist. Review articles for the individual volumes are invited by the volume editors. Single contributions can be specially commissioned. Readership: Polymer scientists, or scientists in related fields interested in polymer and biopolymer science, at universities or in industry, graduate students.
Advances in Shape Memory Polymers Nov 18 2022 Shape memory materials are immensely useful because of their capability to recover their original shapes upon exposure to an external stimulus such as heat, moisture, light or a magnetic field. This book reviews key recent research in shape memory polymers, their properties and applications. Topics include the relationship between morphological structures and shape memory properties; high performance Tg and Tm type shape memory polymers; structures of shape memory polymers with supramolecular switches; and the thermally-active and moisture-active shape memory effect of supermolecular shape memory polymers. Advances in shape memory polymers is an essential reference for polymer and textile material students, scientists, designers, engineers and manufacturers. It is also an invaluable guide for professionals in the biomedical, electronics and engineering industries. Reviews key recent research in shape-memory polymers, their properties and applications Opening chapters address the relationship between morphological structures and shape memory properties and high performance Tg and Tm type shape memory polymers Chapters cover thermally-active and moisture-active shape memory effect of supermolecular shape memory polymers, among other topics
Bonding Elastomers May 20 2020 This review has been written as a practical approach to bonding various kinds of elastomers to substrates such as steel and plastics, as used in the manufacture of diverse products such as rubber covered rolls, urethane fork lift wheels, rubber lining for chemical storage or solid rocket motors, engine bushes and mounts, seals for transmissions, electrical power connectors and military tank track pads. Based on the authors' years of experience working closely with end-use customers and it offers a thorough overview of how to successfully bond rubber to a given substrate in the manufacture of quality rubber engineered components. This review is supported by an indexed section containing several hundred key references and abstracts selected from the Rapra Abstracts database.
Advances in Sustainable Polymers Jul 14 2022 This book discusses synthesis and characterization of sustainable polymers. The book covers opportunities and challenges of using sustainable polymers to replace existing petroleum based feedstock. This volume provides insights into the chemistry of polymerization, and discusses tailoring the properties of the polymers at the source in order fit requirements of specific applications. The book also covers processing of these polymers and their critical assessment. The book will be of use to chemists and engineers in the industry and academia working on sustainable polymers and their commercialization to replace dependence on petroleum-based polymers.
Advanced fibre-reinforced polymer (FRP) composites for structural applications Jan 16 2020 This chapter focuses on the properties, manufacturing processes and quality control of pultruded advanced composites used in civil engineering applications. Pultrusion technology is first briefly explained, with the main features of the raw materials used being introduced, and the philosophy underlying the development of pultruded advanced composites discussed. A detailed description of the pultrusion process then follows, covering the equipment and procedure, technical specifications and quality control. Subsequently, the types, properties, applications and sustainability of pultruded profiles, reinforcing bars and strengthening strips are described. The final part of the chapter discusses future trends for the pultrusion of the advanced composites used in civil engineering applications.
Science and Technology of Polymers and Advanced Materials Jul 02 2021 This book summarizes the state ofthe art research presented at the Fourth International Conference on Frontiers of Polymersand Advanced Materialsheld in Cairo, Egypt in January 4-9, 1997. This conference follows the successful conferences held in Kuala Lumpur, Malaysia in 1995, in Jakarta, Indonesia in 1993 andin

New Delhi, India in 1991. These conferences focussed on the most recent and important advances in a wide range of carefully chosen subject areas dealing with advanced materials, their science and technology and new business opportunities resulting from recent technological advances. As its predecessors, the conference held in Cairo was truly international with strong participation of 488 deiegales representing 37 countries from the USA and Egypt, as weil as Europe, South East Asia, Japan, South Africa and the Middle East. The conference was organized by the Egyptian Academy of Scientific Research and Technology, The Arab Society ofMaterials Science and the State University ofNew Y ork at Butfalo. The stated goals ofthe conference were: • To highlight advances and new. findings in the general area of polymers and advanced materials. - • T o foster global collaboration between the USA, Egypt and other nations in the general field of polymers and advanced materials. • To promote the development of scientific ilifrastructure in this field among the different participating countries, especially in the Middle East. • To create a basisforfuture long-term scientific exchanges between the USA and Egypt, and/or other countries.

Advances in Polymer Coated Textiles Dec 15 2019 Polymer coated textiles are known as engineered composite materials at macro scale. Coating can offer significant improvements to the substrate, mainly of the physical (like impermeability and fabric abrasion) and/or of overall chemical properties; as well as the appearance, by combining advantages of the components.Polymer coated systems employ various kinds of textile substrate structures available, mostly of technical textiles. Since there are a number of possibilities for different types of polymers and their combinations, textile structures as well as their combinations are possible; it is widely open to creativities and almost every day some new innovative application is being introduced. Polymer coated textile industry, being parallel to the developments in the textile research, is so dynamic that, today, applications like reactive coatings with nanoparticles (with self cleaning, self sterilizing surfaces), systems with conductive polymer coatings to provide EM shielding, electronic textile systems -with body monitoring properties-, environmental responsive systems etc. are already somewhat classical and are considered almost left in the shade of incoming new developments. This book is an up-to-date summary of the subject by considering the passage from conventional to emerging technologies. Criteria for selection of the coat and textile are considered and the manufacturing basics of the system are summarized. Emerging technologies and applications (including smart, intelligent and nanostructured applications) are completed by testing and quality control methods of these systems.The book is written for all that are interested in this interdisciplinary area, it certainly will prove to be of great help to textile and polymer technologists, to engineers, to scientists, as well as to students.

Complex Macromolecular Architectures Dec 19 2022 The field of CMA (complex macromolecular architecture) stands at the cutting edge of materials science, and has been a locus of intense research activity in recent years. This book gives an extensive description of the synthesis, characterization, and self-assembly of recently-developed advanced architectural materials with a number of potential applications. The architectural polymers, including bio-conjugated hybrid polymers with poly(amino acid)s and gluco-polymers, star-branched and dendrimer-like hyperbranched polymers, cyclic polymers, dendrigraft polymers, rod-coil and helix-coil block copolymers, are introduced chapter by chapter in the book. In particular, the book also emphasizes the topic of synthetic breakthroughs by living/controlled polymerization since 2000. Furthermore, renowned authors contribute on special topics such as helical polyisocyanates, metallopolymers, stereospecific polymers, hydrogen-bonded supramolecular polymers, conjugated polymers, and polyrotaxanes, which have attracted considerable interest as novel polymer materials with potential future applications. In addition, recent advances in reactive blending achieved with well-defined end-functionalized polymers are discussed from an industrial point of view. Topics on polymer-based nanotechnologies, including self-assembled architectures and suprastructures, nano-structured materials and devices, nanofabrication, surface nanostructures, and their AFM imaging analysis of hetero-phased polymers are also included. Provides comprehensive coverage of recently developed advanced architectural materials Covers hot new areas such as o click chemistry o chain walking o polyhomologation o ADMET Edited by highly regarded scientists in the field Contains contributions from 26 leading experts from Europe, North America, and Asia Researchers in academia and industry specializing in polymer chemistry will find this book to be an ideal survey of the most recent advances in the area. The book is also suitable as supplementary reading for students enrolled in Polymer Synthetic Chemistry, Polymer Synthesis, Polymer Design, Advanced Polymer Chemistry, Soft Matter Science, and Materials Science courses. Color versions of selected figures can be found at www.wiley.com/go/hadjichristidis

Advances in Polymeric Systems for Drug Delivery Nov 13 2019 This title examines new drug delivery strategies utilizing intelligent polymeric materials that perform sensing, processing and response functions. The authors demonstrate the design of polymers with integrated intelligent functions to achieve site specific and temporally controlled drug delivery, specifically for pharmaceutical applications. Using stimuli-responsive polymers as molecular devices for self-regulation and externally modulated drug delivery systems are reviewed from multi-disciplinary perspectives, employing materials science and bio-engineering as an important foundation.

Advances in Polymers for Biomedical Applications Apr 18 2020 Polymers have generated considerable interest in a large number of technologically important fields such as human healthcare systems. Polymers represent a very important domain of materials and have become an integral part of day to day human life. Polymers exist in nature; they have been and continue to be an integral part of the universe. This book is intended for scientists and researchers to use in their research or in their professional practice in polymer chemistry and its biomedical applications. Multiple biological, synthetic and hybrid polymers are used for multiple medical applications. A wide range of different polymers are available, and they have the advantage to be tunable in physical, chemical and biological properties and in a wide range to match the requirements of specific applications. This book gives a brief overview about the introduction and developments of polymers for different applications. The biomedical polymers comprise not only bulk materials, but also coatings and pharmaceutical nano-carriers for drugs. The surface modification of the inorganic nanoparticles with a physically or chemically end-tethered polymer chain has been employed to overcome the problems associated with the polymers. Chemically attached polymer chains not only stabilize the inorganic nanoparticles, but also lead to photosensitivity, bioactivity, biocompatibility and pharmacological properties in the composites. Polymer encapsulated silica nanocomposites (mesoporous) have potential applications in different fields, such as optics, bio-catalysis, microelectronics bone tissue engineering, coatings cosmetics, inks, agriculture, drug release systems, diagnoses, enzyme imaging, temperature-responsive materials, and thermosensitive vehicles for cellular imaging. Polymer grafted nanosized particles are known to have excellent properties such as good dispersion ability in

solvents and polymer matrices. Polymer-based controlled drug delivery systems have some specific advantages, such as improved efficiency and reduced toxicity. The incorporation of a thermoresponsive polymer layer often enhances protein absorption and specific biomolecular tagging through hydrogen bonding. As a result, the nanocomposite gets cleared from the body at a faster rate (blood residence becomes low). This book is composed of fourteen edited chapters; it is intended for scientists and researchers to use in their research or in their professional practice in polymer chemistry and its biomedical applications.

Developments in Fiber-Reinforced Polymer (FRP) Composites for Civil Engineering Oct 13 2019 The use of fiber-reinforced polymer (FRP) composite materials has had a dramatic impact on civil engineering techniques over the past three decades. FRPs are an ideal material for structural applications where high strength-to-weight and stiffness-to-weight ratios are required. Developments in fiber-reinforced polymer (FRP) composites for civil engineering outlines the latest developments in fiber-reinforced polymer (FRP) composites and their applications in civil engineering. Part one outlines the general developments of fiber-reinforced polymer (FRP) use, reviewing recent advancements in the design and processing techniques of composite materials. Part two outlines particular types of fiber-reinforced polymers and covers their use in a wide range of civil engineering and structural applications, including their use in disaster-resistant buildings, strengthening steel structures and bridge superstructures. With its distinguished editor and international team of contributors, Developments in fiber-reinforced polymer (FRP) composites for civil engineering is an essential text for researchers and engineers in the field of civil engineering and industries such as bridge and building construction. Outlines the latest developments in fiber-reinforced polymer composites and their applications in civil engineering Reviews recent advancements in the design and processing techniques of composite materials Covers the use of particular types of fiber-reinforced polymers in a wide range of civil engineering and structural applications

Advanced Polymer Composites for Structural Applications in Construction Dec 07 2021 Over the past three decades advanced polymer composites have emerged as an attractive construction material for new structures and the strengthening/rehabilitation of existing buildings and bridges. The techniques associated with the technology, analysis and design of polymer composites in construction are continually being researched and the progress made with this exciting material will continue at an ever- increasing rate to meet the demands of the construction industry. This volume of proceedings is from the Second ACIC 2004 International Conference, which focused on the application and further exploitation of advanced composites in construction. The conference allowed practising engineers, asset managers, researchers and representative of regulatory bodies to promote the active exchange of scientific and technical information on the rapidly changing scene of advanced composites in construction. This volume focuses on the presentation of new concepts, techniques and case studies, which will lead to greater exploitation of advanced polymer composites and FRP materials for civil engineering infrastructure, rehabilitation and renewal. Presents new concepts, techniques and case studies

Advanced fibre-reinforced polymer (FRP) composites for structural applications Jan 08 2022 This chapter addresses all aspects pertaining to stresses inherent within civil applications of advanced composites, particularly the critical interfacial adhesive stresses usually controlling the design strength for externally bonded FRP composites. Informed discussions and explanations are presented on influential aspects closely affecting the distribution and magnitude of interfacial stresses along the bondline. Traditional and promising experimental methods for stress estimation are addressed, together with a corresponding brief literature review highlighting their evolution and practical advantages and disadvantages. Theoretical and numerical methods for interfacial stress analyses are also reviewed for different FRP bonding applications, and their stress prediction capabilities are verified with experimental validations. Finally, key conclusions and recommendations for future trends in the stress characterizations of adhesive joints are provided.

Polymers and Other Advanced Materials Nov 06 2021 Proceedings of the Third International Conference on Frontiers of Polymers and Advanced Materials held in Kuala Lumpur, Malaysia, January 16-20, 1995

Advances in Polymer Friction and Wear Jun 13 2022 Polymers and polymer composites have been increasinqly used in place of metals for various industries; namely, aerospace, automotive, bio-medical, computer, electrophotography, fiber, and rubber tire. Thus, an understanding of the interactions between polymers and between a polymer and a rigid counterface can enhance the applications of polymers under various environments. In meet ing this need, polymer tribology has evolved to deal with friction, lubrication and wear of polymeric materials and to answer some of the problems related to polymer-polymer interactions or oolymer rigid body interactions. The purpose of this first International Symposium was to introduce advances in studies of polymer friction and wear, especially in Britain and the U.S.S.R. Most earlier studies of the Fifties were stimulated by the growth of rubber tire industries. Continuous research through the Sixties has broadened the base to include other polymers such as nylon, polyolefins, and poly tetra fluoroethylene, or PTFE. However, much of this work was published in engineering or physics journals and rarely in chemistry journals; presumably, the latter have always considered the work to be too applied or too irrelevant. Not until recent years have chemists started to discover words such as tribo-chemistry or mechano chemistry and gradually become aware of an indispensable role in this field of polymer tribology. Thus, we were hoping to bring the technology up to date during this SympOSium, especially to the majority of participants, polymer chemists by training.

Fusion Bonding of Polymer Composites Jun 01 2021 Fusion bonding is one of the three methods available for joining composite and dissimilar materials. While the other two, mechanical fastening and adhesion bonding, have been the subject of wide coverage both in textbooks and monographs, fusion bonding is covered here substantially for the first time. Fusion bonding offers a number of advantages over traditional joining techniques and it is anticipated that its use will increase dramatically in the future because of the rise in the use of thermoplastic matrix composites and the growing necessity for recyclability of engineering assemblies. Fusion Bonding of Polymer Composites provides an in-depth understanding of the physical mechanisms involved in the fusion bonding process, covering such topics as: - heat transfer in fusion bonding; - modelling thermal degradation; - consolidation mechanisms; - crystallisation kinetics; - processing-microstructure-property relationship; - full-scale fusion bonding; - fusion bonding of thermosetting composite/thermoplastic composite and metal/thermoplastic joints. The book focuses on one practical case study using the resistance welding process. This example exposes the reader to the development of processing windows for a novel manufacturing process including the use of experimental test programmes and modelling strategies.

Recent Advances in Smart Self-Healing Polymers and Composites Nov 25 2020 There have been many new developments since the first edition of this book was published back in 2015. These can be summarized as follows: integration of multiple properties into self-healing polymer materials, such as the shape memory effect and flame retardancy; beyond self-healing and the development of

recyclable thermoset polymers; and the application of self-healing polymers in both 3D and 4D printing. Recent Advances in Smart Self-healing Polymers and Composites, Second Edition provides a comprehensive introduction to the fascinating field of smart self-healing polymers and composites. All chapters are brought fully-up-to-date with the addition of six brand new contributions on the characterization of self-healing polymers, light-triggered self-healing, additive manufacturing, multifunctional thermoset polymers with self-healing ability, and recyclable thermoset polymers and 4D printing. It is written for a large readership including not only R&D researchers from diverse backgrounds such as chemistry, materials science, aerospace, physics, and biological science, but also for graduate student working on self-healing technologies as well as their newly developed applications. Features new chapters on characterization of self-healing polymers, light-triggered self-healing, additive manufacturing, multifunctional thermoset polymers with self-healing ability, recyclable thermoset polymers and 4D printing All chapters have been significantly updated from the previous edition Provides a grounding in all key areas of research to bring people up to speed with the latest developments

Advanced fibre-reinforced polymer (FRP) composites for structural applications Sep 04 2021 This chapter continues the discussions of the development of advanced polymer composite material applications associated with bridge engineering. It focuses on the rehabilitation of metallic bridge structures, all-FRP composite bridges and bridges built with hybrid systems. covered the materials used in FRP composites, in-service properties and applications of FRP composites in bridge enclosures, the rehabilitation of reinforced and prestressed concrete bridge beams and columns.

Hydrogen Bonding in Polymeric Materials Jan 28 2021 Summarizing our current knowledge of the topic, this book describes the roles and effects of hydrogen bonding in polymer materials by reviewing the latest developments over recent years. To this end, it discusses all relevant aspects from the fundamentals, via characterization, to properties and applications in various polymeric materials, including polymer blends, block copolymers, mesoporous materials, biomacromolecules and nanocomposites. Invaluable reading for scientists in polymers and materials as well as those working in macromolecular chemistry.

Advanced fibre-reinforced polymer (FRP) composites for structural applications Oct 25 2020 There is strong evidence that the oil and gas industry has become increasingly interested in using pipes and risers made of fiber-reinforced polymer (FRP) composite materials. Moreover, oil and gas exploration nowadays has to be conducted in much deeper water depths (500–1500m and deeper), thus requiring more resilient and lighter materials. in this section various applications of FRP in relation to pipes and risers are discussed to familiarise the reader with various FRP and hybrid pipes. The issues affecting the long-term performance of these materials, as well as issues involved with joining pipes and risers are also covered. Finally, the recent trends related to the use of FRP for repair and rehabilitation of deteriorated metallic pipes are presented.

Advanced fibre-reinforced polymer (FRP) composites for structural applications Mar 10 2022 This chapter briefly discusses the performance and durability of bonded composite systems used for on-site rehabilitation of timber and concrete structures. In spite of some recent developments, the exploitation of their full potential is still often restrained by the lack of structural design guidance, standards for durability assessment and on-site acceptance testing. Therefore, this chapter provides a review of current understanding on the use of hybrid bonded composite systems on the construction site in terms of structural repair, reinforcement, and seismic retrofit. It focuses on the requirements and practical difficulties in the work on-site with regards to the performance and durability of the rehabilitated structure, the characteristics and requirements that must be fulfilled by structural adhesives and advanced polymer composite materials, and the subsequent need for quality control and in-service monitoring. It also highlights the factors affecting performance and durability of bonded joints. Finally, a general overview of the research needs and a bibliography giving references to more detailed information on this topic is given.

Polymer Bonding 2004 Sep 16 2022 Rapra Technology Limited launched its first conference focusing on the bonding of both rubber and plastics to various substrates. The conference aimed to widen the area of discussion from a purely rubber or purely plastic based topic to include those additional related bonding application areas. Papers discussing bonding within the polymer industries and from academic researchers will enable the reader to more fully understand the problems and their solutions for the bonding between polymers and a wide range of substrates. Topics covered at Polymer Bonding 2004 include: latest material advances, new processing technologies, analysis of bonding techniques, progress in application technology, formulation advancement and business and industry issues. List Of Papers...Session 1: Technology Overview; A Review of Recent Developments in Bonding of Steel Products for Rubbers and Plastics Reinforcement Dr Daniel Mauer, N.V. Bekaert S.A. Bonds Factor: Effects from Processing and Chemistry Mr RJ DelVecchio, Technical Consulting Services, USA; Quantum Leap in Polymer Innovation Performance through Advanced Technology Management Dr Wolfram Keller, P R T M, Germany; Session 2: Polymer Bonding Analysis; Can Test Pieces Predict Component Performance? Dr Marina Fernando, Charles Forge & Jonathan Clarke, TARRC, UK; The Development and Exploitation of Accelerated Durability Tests - The; new ASTM D429 Method G immersion Test and Potential Future Developments; Mr Peter Hansen, MERL, UK; Analysis of Adhesion Differences by Nano-Indentation and Cure Kinetics; in a Rubber-Glass Composite Dr Chris Stevens, NGF Europe Ltd, UK; Session 3: Novel Bonding Techniques And Applications; Self-Adhesive Silicone Rubber: High Speed Processing in Conventional; Injection Moulding Dr Sascha Buechel, Wacker-Chemie GmbH, Germany; +++ Paper Unavailable At Time Of Print +++; Bonding Cellulosic Substrates to Polyolefins without Corona treatment; or use of a Primer. Greece; A Shift Toward Two Component Adhesive Packaging that Fits in Standard; Caulking Guns Ms Meghann Horner & Crispin Dean, TAH Europe Inc, UK &; Dan Mottram, TAH Industries, USA; Hybrid Nonisocyanate Polyurethane Adhesives; Prof. Oleg Figovsky, EFM - Enviromentally Friendly Materials GmbH; Germany; Bonding Plastics with Cyanoacrylates and UV Curing Adhesives Mr Bob; Goss, Henkel Loctite Adhesives Ltd, UK; Session 4: Developments In Bonding Technology; Reactive Fluid Bonding Systems; Dr Daniel L Neuman, DuPont Dow Elastomers, USA; Water Based Bonding Agents; Mr Greg Rawlinson & Dr Keith Worthington, Chemical Innovations Limited; (CIL), UK; Aramid as Reinforcement in TPE's: A Method for Measuring Adhesion Ms; Annamarie Zuuring, Teijin Twaron BV, The Netherlands; +++ Paper Unavaiable At Time Of Print +++; Non-Hygroscopic Polyamide Bonding TPV; Mr Synco de Vogel, Solvay Engineered Polymers GmbH, Germany; +++ Paper Unavaiable At Time Of Print +++; Hard-Soft Combinations with Silicone Rubber - Innovative Technical; Solutions Dr Joachim Hegge, & Stefan Rist, GE Bayer Silicone GmbH & Co.; Automotive; Parts Production Mr Aissa Benarous, Chemical Innovations Limited (CIL); UK; Rapra Technology 2004

Polymer Nanocomposites for Advanced Engineering and Military Applications Jul 22 2020 The field of polymer nanocomposites has become essential for engineering and military industries over the last few decades as it applies to computing, sensors, biomedical

microelectronics, hard coating, and many other domains. Due to their outstanding mechanical and thermal features, polymer nanocomposite materials have recently been developed and now have a wide range of applications. Polymer Nanocomposites for Advanced Engineering and Military Applications provides emerging research on recent advances in the fabrication methods, properties, and applications of various nano-fillers including surface-modification methods and chemical functionalization. Featuring coverage on a broad range of topics such as barrier properties, biomedical microelectronics, and matrix processing, this book is ideally designed for engineers, industrialists, chemists, government officials, military professionals, practitioners, academicians, researchers, and students.

Advanced Polymer Composites for Structural Applications in Construction Feb 09 2022 Fibre reinforced polymer-based composites are set to meet the demand for improvements in construction processes. FRP materials are suitable for use in piping, walls and columns. This volume explores their structural application in construction.

Shape Memory Polymers Jun 20 2020 Shape-memory polymers (SMP) are a unique branch of the smart materials family which are capable of changing shape on-demand upon exposure to external stimulus. The discovery of SMP made a significant breakthrough in the developments of novel smart materials for a variety of engineering applications, superseded the traditional materials, and also influenced the current methods of product designing. This book provides the latest advanced information of on-going research domains of SMP. This will certainly enlighten the reader to the achievements and tremendous potentials of SMP. The basic fundamentals of SMP, including shape-memory mechanisms and mechanics are described. This will aid reader to become more familiar with SMP and the basic concepts, thus guiding them in undergoing independent research in the SMP field. The book also provides the reader with associated challenges and existing application problems of SMP. This could assist the reader to focus more on these issues and further exploit their knowledge to look for innovative solutions. Future outlooks of SMP research are discussed as well. This book should prove to be extremely useful for academics, R&D managers, researcher scientists, engineers, and all others related to the SMP research.

Fusion Bonding of Polymer Composites Jan 20 2023 Fusion bonding is one of the three methods available for joining composite and dissimilar materials. While the other two, mechanical fastening and adhesion bonding, have been the subject of wide coverage both in textbooks and monographs, fusion bonding is covered here substantially for the first time. Fusion bonding offers a number of advantages over traditional joining techniques and it is anticipated that its use will increase dramatically in the future because of the rise in the use of thermoplastic matrix composites and the growing necessity for recyclability of engineering assemblies. Fusion Bonding of Polymer Composites provides an in-depth understanding of the physical mechanisms involved in the fusion bonding process, covering such topics as: - heat transfer in fusion bonding; - modelling thermal degradation; - consolidation mechanisms; - crystallisation kinetics; - processing-microstructure-property relationship; - full-scale fusion bonding; - fusion bonding of thermosetting composite/thermoplastic composite and metal/thermoplastic joints. The book focuses on one practical case study using the resistance welding process. This example exposes the reader to the development of processing windows for a novel manufacturing process including the use of experimental test programmes and modelling strategies.

Advanced Fibre-Reinforced Polymer (FRP) Composites for Structural Applications May 12 2022 Advanced Fibre-reinforced Polymer (FRP) Composites for Structural Applications, Second Edition provides updates on new research that has been carried out on the use of FRP composites for structural applications. These include the further development of advanced FRP composites materials that achieve lighter and stronger FRP composites, how to enhance FRP integrated behavior through matrix modification, along with information on pretension treatments and intelligence technology. The development of new technology such as automated manufacturing and processing of fiber-reinforced polymer (FRP) composites have played a significant role in optimizing fabrication processing and matrix formation. In this new edition, all chapters have been brought fully up-to-date to take on the key aspects mentioned above. The book's chapters cover all areas relevant to advanced FRP composites, from the material itself, its manufacturing, properties, testing and applications in structural and civil engineering. Applications span from civil engineering, to buildings and the energy industry. Covers all areas relevant to advanced FRP composites, from the material itself, its manufacturing, properties, testing and applications in structural engineering Features new manufacturing techniques, such as automated fiber placement and 3D printing of composites Includes various applications, such as prestressed-FRP, FRP made of short fibers, continuous structural health monitoring using advanced optical fiber Bragg grating (FBG), durability of FRP-strengthened structures, and the application of carbon nano-tubes or platelets for enhancing durability of FRP-bonded structures

Advances in New Materials Aug 23 2020 of Polymer Chemistry, Inc. of the American Chemical Society held its The Division 15th Biennial Polymer Symposium on the topic, "Advances in New Materials," November 17-21, 1990, at the Pier 66 Resort and Marina in Ft. Lauderdale, Florida. A three and one half day program was presented by recognized leaders in major areas of new polymeric materials. The topics of the Biennial Symposium included new high performance polymers, polymers for electronic applications, electrically conducting polymers, nonlinear optics, new polymer systems, and polymers derived from biological media. These are the subject areas of this volume of "Contemporary Topics in Polymer Science". The intent of the Symposium was to focus on recent advances in polymeric materials. The technical sessions were complemented by an initial poster session which augmented the various technical sessions. A particular highlight of the meeting was the presentation to Professor Michael Szwarc of the 1990 Division of Polymer Chemistry Award by Dr. J. L. Benham, Chairman of the T Aymer Division. During his Award address, Professor Szwarc described how he had become a polymer chemist and later developed "living polymers." Without a doubt, Professor Szwarc has made a profound contribution to the polymer field, which has yielded many new forms of living polymerization.

Advanced Polymers in Medicine Apr 30 2021 The book provides an up-to-date overview of the diverse medical applications of advanced polymers. The book opens by presenting important background information on polymer chemistry and physicochemical characterization of polymers. This serves as essential scientific support for the subsequent chapters, each of which is devoted to the applications of polymers in a particular medical specialty. The coverage is broad, encompassing orthopedics, ophthalmology, tissue engineering, surgery, dentistry, oncology, drug delivery, nephrology, wound dressing and healing, and cardiology. The development of polymers that enhance the biocompatibility of blood-contacting medical devices and the incorporation of polymers within biosensors are also addressed. This book is an excellent guide to the recent advances in polymeric biomaterials and bridges the gap between the research literature and standard textbooks on the applications of polymers in medicine.

Joining of Polymer-Metal Hybrid Structures Mar 18 2020 A comprehensive introduction to the concepts of joining technologies for hybrid structures This book introduces the concepts of joining technology for polymer-metal hybrid structures by addressing current and new joining methods. This is achieved by using a balanced approach focusing on the scientific features (structural, physical, chemical, and metallurgical/polymer science phenomena) and engineering properties (mechanical performance, design, applications, etc.) of the currently available and new joining processes. It covers such topics as mechanical fastening, adhesive bonding, advanced joining methods, and statistical analysis in joining technology. Joining of Polymer-Metal Hybrid Structures: Principles and Applications is structured by joining principles, in adhesion-based, mechanical fastened, and direct-assembly methods. The book discusses such recent technologies as friction riveting, friction spot joining and ultrasonic joining. This is used for applications where the original base material characteristics must remain unchanged. Additional sections cover the main principles of statistical analysis in joining technology (illustrated with examples from the field of polymer-metal joining). Joining methods discussed include mechanical fastening (bolting, screwing, riveting, hinges, and fits of polymers and composites), adhesive bonding, and other advanced joining methods (friction staking, laser welding, induction welding, etc.). Provides a combined engineering and scientific approach used to describe principles, properties, and applications of polymer-metal hybrid joints Describes the current developments in design of experiments and statistical analysis in joining technology with emphasis on joining of polymer-metal hybrid structures Covers recent innovations in joining technology of polymer-metal hybrid joints including friction riveting, friction spot joining, friction staking, and ultrasonic joining Principles illustrated by pictures, 3D-schemes, charts, and drawings using examples from the field of polymer-metal joining Joining of Polymer-Metal Hybrid Structures: Principles and Applications will appeal to chemical, polymer, materials, metallurgical, composites, mechanical, process, product, and welding engineers, scientists and students, technicians, and joining process professionals.

Science and Technology of Polymers and Advanced Materials Aug 03 2021 Increasing interest in lightweight and high-performance materials is leading to significant research activity in the area of polymers and composites. One recent focus is to develop multifunctional materials that have more than one property tailored as to the specified design requirements, in addition to achieving low density. The possibility of simultaneously tailoring several desired properties is attractive but very challenging, and it requires significant advancement in the science and technology of high-performance functional polymers and composites. This volume presents a selection of new approaches in the field of composites and nanomaterials, polymer synthesis and applications, and materials and their properties. Some composites/nanocomposites and interfaces are explored as well, some with medical applications. The authors also look at simulations and modeling, synthesis involving photochemistry, self-assembled hydrogels, and sol-gel processing.

Advanced Polymer Composites and Polymers in the Civil Infrastructure Oct 17 2022 In recent years, the fabrication technologies for the production of advanced polymer composites have been revolutionised by sophisticated manufacturing techniques. These methods have enabled polymer composite materials to produce good quality laminates with minimal voids and accurate fibre alignment. This book familiarises and provides a background to the understanding and use of advanced polymer composites in the civil infrastructure; numerous examples have been provided to illustrate the use and versatility of the material. Furthermore, the book discusses the current fabrication techniques, design methods and formulae for the design of structural composite systems. In addition it discusses the fundamentals of geosynthetics used in geotechnical engineering. The book introduces the fibres and matrices that are used to manufacture composites, their mechanical and in-service properties and their long term loading characteristics; all these properties are specifically associated with the construction industry. The chapters then discuss the design aspects for 'all composite' units, as well as systems used for the renewal of civil infrastructure. Finally, the book demonstrated the unique possibilities of combining composites with conventional materials to form units in which the various materials making up the unit are loaded in the mode that specifically suits their mechanical characteristics.