

Crystallization Behavior Of Pet Materials

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~~Crystallization behavior of PET 'Crystalline' means that the polymer chains are parallel and closely packed, and 'amorphous' means that the polymer chains are disordered [8].~~

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~~Crystallization is very significant properties affecting all mechanical and physical properties of PET just as for all kind of polymers. As a result, this subject has taken in very good interest so far and it is believed that this interest will go on increasingly. Keywords: Crystallization, material properties, PET~~

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~~Öz. Polyethylene terephthalate, commonly coded as PET, PETE, is a thermoplastic polymer resin of the polyesters and is used in liquid containers, drinks, food and synthetic fibres. Depending on its processing and thermal conditions, PET may exist both as amorphous and as semi-crystalline. PET may appear opaque, white and transparent depending on its crystalline and amorphous structure.~~

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~~The process degrades PET into two main reaction products, dimethyl terephthalate (DMT) and ethylene glycol (EG). Subsequent separation by distillation combined with crystallization removes critical impurities and non-PET components from co-polymers, providing monomers of high purity needed for re-polymerization purposes.~~

~~PET Recycling - Contributions of Crystallization to~~

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Abstract: PET is a thermoplastic polymer that is extensively used in the production of packaging material for applications such as drawn fibers, bottles, and stretched films. Its industrial applicability is largely based on the fact that it undergoes strain induced crystallization on deformation just above its glass transition temperature Tg. Crystallization imparts increased density, stiffness, dimensional stability, and resistance to permeability. However, the crystallization process and the mechanical behavior of PET above its Tg is highly dependent on factors such as temperature, strain rate, and the mode of deformation. This makes it necessary to have a reliable material model that can be used in FEM simulations to predict its mechanical behavior. This thesis is aimed at achieving two goals: i) to mechanically characterize three PET-PCT blends that have not been previously tested (PET00, PET1.5, and PET12) and to do a comparative study of the five PET-PCT blends. This was done by testing five PET-PCT blends over a range of temperatures and strain rates in uniaxial compression and plane strain compression modes. ii) to modify the Dupaix-Krishnan constitutive model to predict the occurrence and effects of strain induced crystallization in PET. This involved testing PET and PETG under load-hold conditions to identify the criteria that induce crystallization in PET. Subsequently the material model was modified by incorporating these criteria. Monotonic tests were conducted for the five PET-PCT blends (PET00, PET1.5, PET3.5, PET12, and PETG) at temperatures of 90C and 100C and strain rates of 0.1/s, 0.05/s, and 0.005/s in uniaxial compression and plane strain compression. The experimental results were then fit to the Dupaix-Boyce constitutive model for these five blends. The model was able to successfully capture the dependence of the material behavior on temperature, strain rate, and strain state above Tg for the five materials. The experimental results were also useful in making a comparison of the mechanical behavior of the five materials to each other. This showed that the behavior of the low PCT content materials were different from that of the high PCT content materials at conditions that favored crystallization. Load hold experiments were conducted on PET00, PET3.5 and PETG at temperatures of 90C and 100C, and strain rates of 0.1/s and 0.005/s in both uniaxial and plane strain compression. The results obtained were similar to that of the monotonic tests, as they showed that while PET00 and PET3.5 crystallized at certain favorable conditions, PETG did not. Therefore, it was found that the load hold condition was not one of the factors that lead to crystallization. Crystallization occurred in PET only when all of the following conditions were met: i) high strain rates of 0.1/s and above, ii) temperatures of 90C-100C, iii) plane strain compression and iv) after a certain amount of deformation. Based on these findings, changes were made to the Dupaix-Krishnan material model to improve its ability to predict the occurrence and effects of strain-induced crystallization on the large strain deformation behavior of PET near Tg.

Selected, peer reviewed papers from the 3rd International Conference on Advanced Engineering Materials and Technology (AEMT 2013), May 11-12, 2013, Zhangjiajie, China

Nano-Glass Ceramics: Processing, Properties and Applications provides comprehensive coverage of synthesis and processing methods, properties and applications of the most important types of nano-glass ceramics, from a unique material science perspective. Emphasis is placed on the experimental and practical aspects of the subject while covering the theoretical and practical aspects and presenting, numerous examples and details of experimental methods. In the discussing the many varied applications of nano-glass ceramics, consideration is given to both, the fields of applications in which the materials are firmly established and the fields where great promise exists for their future exploitation. The methods of investigation adopted by researchers in the various stages of synthesis, nucleation, processing and characterization of glass ceramics are discussed with a focus on the more novel methods and the state of the art in developing nanostructured glass ceramics. Comprehensive coverage of nanostructured glass ceramics with a materials science approach. The first book of this kind Applications-oriented approach, covering current and future applications in numerous fields such as Biomedicine and Electronics Explains the correlations between synthesis parameters, properties and applications guiding R&D researchers and engineers to choose the right material and increase cost-effectiveness

A much-needed overview of the state of the art of hyperbranched polymers The last two decades have seen a surge of interest in hyperbranched polymers due to their ease of synthesis on a large scale and their promising applications in diverse fields, from medicine to nanotechnology. Written by leading scientists in academia and industry, this book provides for the first time a comprehensive overview of the topic, bringing together in one complete volume a wealth of information previously available only in articles scattered across the literature. Drawing on their work at the cutting edge of this dynamic area of research, the authors cover everything readers need to know about hyperbranched polymers when designing highly functional materials. Clear, thorough discussions include: How irregular branching affects polymer properties and their potential applications Important theoretical basics, plus a useful summary of characterization techniques How hyperbranched polymers compare with dendrimers as well as linear polymers Future trends in the synthesis and application of hyperbranched polymers Geared to novices and experts alike, Hyperbranched Polymers is a must-have resource for anyone working in polymer architectures, polymer engineering, and functional materials. It is also useful for scientists in related fields who need a primer on the synthesis, theory, and applications of hyperbranched polymers.

Textile testing is an important field of textile sciences involving experimental evaluation of conventional as well as technical textile products. This book aims to provide technical details, required protocols and procedures for conducting any specific evaluation test along with key parameters. The book covers the topics in two main sections, first one for the conventional textile testing techniques starting from fiber to final product while the second one focusses on testing of technical textiles. Written with a reader friendly approach, it will cater to graduate students in textile engineering as well as industry personnel, focusing on following key points: Addresses all techniques for testing both conventional and technical textiles. Describes testing techniques compliance with the latest requirements of the updated EN ISO and AATCC standards. Provides detailed description on the testing of technical textiles and their products. Discusses the operations conditions, like atmospheric conditions, and human error with cause and effect diagrams. Covers both destructive and non-destructive testing.

The degradation of plastics is most important for the removal and recycling of plastic wastes. The book presents a comprehensive overview of the field. Topics covered include plastic degradation methods, mechanistic actions, biodegradation, involvement of enzymes, photocatalytic degradation and the use of cyanobacteria. Also covered are the market of degradable plastics and the environmental implications. Keywords: Degradable Plastics, Bioplastics, Biodegradable Plastics, Enzymes, Cyanobacteria, Photocatalytic Degradation, Wastewater Treatment, Degradable Plastic Market, Polyethylene, Polypropylene, Polystyrene, Polyvinyl Chloride, Polyurethane, and Polyethylene Terephthalate.

Volume is indexed by Thomson Reuters CPCI-S (WoS). The studies presented in this book cover the topics of: composites, micro/nano-materials and equipment, alloy materials, steel, polymer materials, optical/electronic/magnetic materials, energy materials and new energy technology, environmentally-friendly materials and waste utilization, biomaterials and preparation technology, thin films, structural materials and earthquake-resistant structures, functional materials, surface-engineering/coatings, modeling, analysis and simulation, materials processing technology, laser-processing technology, mechanical behavior and fracture, tooling testing and evaluation of materials, thermal engineering theory and applications, detection and control technology.

High-Performance Apparel: Materials, Development, and Applications covers the materials and techniques used in creating high-performance apparel, the technical aspects of developing high-performance garments, and an array of applications for high-performance clothing and wearable technology. Part One covers fabric construction for high-performance garments, from fiber types and spinning methods, to weaving, knitting, finishing, and joining techniques. Development of high-performance apparel is covered in Part Two, with particular emphasis on design and product development for function and wearer comfort. Part Three covers a range of applications and wearable technology that make use of high-performance apparel, including chapters on sportswear, protective clothing, and medical, military, and intelligent textiles. The book provides an excellent resource for all those engaged in garment development and production, and for academics engaged in research into apparel technology and textile science. Offers a range of perspectives on high-performance apparel from an international team of authors with diverse expertise Provides systematic and comprehensive coverage of the topic from fabric construction, through apparel design and development, to the range of current and potential applications Presents an excellent resource for all those engaged in garment development and production, and for academics engaged in research

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