Creep Recovery

Creep-recovery is a deformation response for a typical viscoelastic materials. For the structural design, it is important to understand recovery behavior for the materials, by applying a constant stress for a period of time (i.e., creep) followed by removing the stress, and examining the subsequent relaxation response of the material (i.e., recovery) over a specifi duration. This paper describes the bending creep behavior of two types of bamboo-based products, bamboo-laminated veneer lumber (BLVL), and glued-laminated bamboo (GLB, also called Bamboo Glulam) at diffrent stress levels for half a year and recovery for the same time. The conclusions showed that: (1)The stress level was more sensitive on creep property for BLVL than GLB. The relative creeps were ranged from 0.19 (30% stress level) to 0.49 (70% stress level) for BLVL, and from 0.41 (30% stress level) to 0.56 (70% stress level) for GLB. (2) The creep resistance of GLB was less than that of BLVL from stress level of 30u201350%. The relative creep of GLB was obtained as 0.41, 2.2 times than that of BLVL at stress level of 30%, while 2.7 times at stress level of 50%. (3) For both BLVL and GLB, the instantaneous recovery ratio (elastic recovery to elastic creep) was reduced with the stress level increased, while residual ratio (residual deformation corresponded to the total creep deflctions) was increased. (4) Burgers model fis the creep data very well for both BLVL and GLB with R2 > 0.94. The viscous parameter of BLVL was more close to the residual deflction obtained from experiment data than that of GLB, indicating that the recovery model fit better for BLVL than that of GLB.

Today research on creep and shrinkage of concrete is diversified to such a degree that specialists working in different areas sometimes find it difficult to understand one-another. Materials scientists are mainly interested in processes on a microstructural level but they do not necessarily understand the relevance of time dependent deformation in structural design. On the other hand engineers who apply simplified model laws in non-elastic structural analysis are not always in the position to judge the limitations implied in their approach. It is generally realized that further development can be stimulated by a more effective exchange of results and ideas among the different groups involved. In an attempt to bridge this obvious gap in September 1980 there was a Conference organized at Swiss Federal Institute of Technology in Lausanne. The papers presented at this meeting covered the wide range starting with microstructural aspects and mechanisms and including constitutive modelling and structural creep analysis. These contributions together with summaries of two panel discussions are being published in this volume. All serious of the meeting have been introduced by invited lectures. These papers will be published in a special volume "Creep and Moisture Effects in Concrete". This special volume is rather to be a general survey of the different areas covered while the present conference proceedings provide a unique selection of research papers. Nowadays time-dependent deformation of concrete can be taken into consideration realistically by computerized structural analysis.

Volume is indexed by Thomson Reuters CPCI-S (WoS). This collection reflects the current worldwide state of knowledge concerning the latest scientific concepts and technological developments in the characterization, testing, mechanics, modelling, manufacturing and applications of various classes of composite materials and structures. It is also intended to promote the sharing of ideas and emerging technologies, as well as to foster R & D collaboration among academia, research institutions and the relevant industries.

One of the principal objects of theoretical research in any department of knowledge is to find the point of view from which the subject appears in its greatest simplicity. J. Willard Gibbs This book is an outgrowth of lectures I have given, on and off over some sixteen years, in graduate courses at the California Institute of Technology, and, in abbreviated form, elsewhere. It is, nevertheless, not meant to be a textbook. I have

aimed at a full exposition of the phenomenological theory of linear viscoelastic behavior for the use of the practicing scientist or engineer as well as the academic teacher or student. The book is thus primarily a reference work. In accord with the motto above, I have chosen to describe the theory of linear viscoelastic behavior through the use of the Laplace transformation. The treatment oflinear time-dependent systems in terms of the Laplace transforms of the relations between the excitation add response variables has by now become commonplace in other fields. With some notable exceptions, it has not been widely used in viscoelasticity. I hope that the reader will find this approach useful.

This book was written with a dual purpose, as a reference book for practicing engineers and as a textbook for students of prestressed concrete. It represents the fifth generation of books on this subject written by its author. Significant additions and revisions have been made in this edition. Chapters 2 and 3 contain new material intended to assist the engineer in understanding factors affecting the time-dependent properties of the reinforcement and concrete used in prestressing concrete, as well as to facilitate the evaluation of their effects on prestress loss and deflection. Flexural strength, shear strength, and bond of prestressed concrete members were treated in a single chapter in the of flexural strength has third edition. Now, in the fourth edition, the treatment been expanded, with more emphasis on strain compatibility, and placed in Chapter 5 which is devoted to this subject alone. Chapter 6 of this edition, on flexural-shear strength, torsional strength, and bond of prestressed reinforce ment, was expanded to include discussions of Compression Field Theory and torsion that were not treated in the earlier editions. In similar fashion, expanded discussions of loss of prestress, deflection, and partial prestressing now are presented separately, in Chapter 7. Minor additions and revisions have been made to the material contained in the remaining chapters with the exception of xv xvi I PREFACE Chapter 17. This chapter, which is devoted to construction considerations, has important new material on constructibility and tolerances as related to prestressed concrete.

CREEP, SHRINKAGE AND DURABILITY MECHANICS OF CONCRETE AND CONCRETE STRUCTURES contains the keynote lectures, technical reports and contributed papers presented at the Eighth International Conference on Creep, Shrinkage and Durability of Concrete and Concrete Structures (CONCREEP8, Ise-shima, Japan, 30 September - 2 October 2008). The topics covered

Already in its 5th edition, this standard work describes the principles of rheology clearly, vividly and in practical terms. The book includes the rheology of additives in waterborne dispersions and surfactant systems. Not only it is a great reference book, it can also serve as a textbook for studying the theory behind the methods. The practical use of rheology is presented in the areas quality control, production and application, chemical and mechanical engineering, materials science and industrial research and development. After reading this book, the reader should be able to perform tests with rotational and oscillatory rheometers and interpret the results correctly.

It is thought that creep recovery may be one of the main causes of acceleration of crack growth rates under variable loads. To explore this possibility, the effects of creep recovery and hardening on the near-tip fields are examined in this paper. Robinson's constitutive relation, which is based on the Bailey-Orowan model, is used to take these effects into account. In this model, the strain rate is proportional to the nth power of an effective stress, which is the difference between applied stress and internal stress.

The rate of the internal stress is given by the difference between a hardening term and a recovery term, which are proportional to the strain rate divided by the ?th power of the internal stress and the (n - ?)th power of the internal stress, respectively.

More than 700 presentations at ANTEC?98, the Annual Technical Conference of the Society of Plastics Engineers, comprise an encyclopedic compilation of the newest plastics technology available. This is the single most comprehensive annual presentation of new plastics technology!

Creep and Fatigue in Polymer Matrix Composites, Second Edition, updates the latest research in modeling and predicting creep and fatigue in polymer matrix composites. The first part of the book reviews the modeling of viscoelastic and viscoplastic behavior as a way of predicting performance and service life. Final sections discuss techniques for modeling creep rupture and failure and how to test and predict long-term creep and fatigue in polymer matrix composites. Reviews the latest research in modeling and predicting creep and fatigue in polymer matrix composites Puts a specific focus on viscoelastic and viscoplastic modeling Features the time-temperature-age superposition principle for predicting long-term response Examines the creep rupture and damage interaction, with a particular focus on time-dependent failure criteria for the lifetime prediction of polymer matrix composite structures that are illustrated using experimental cases

This text provides an authoritative source of information for those wishing to increase their knowledge of the molecular bases of gluten functionality and nutritional role.

This report constitutes a detailed account of the more important results of the programs of testing and observations upon the structural behavior of Norris and Hiwassee Dams. These programs were initiated during the construction period for the purpose of guiding operations, and continued after the respective dams were placed in service. The study after construction was aimed at securing knowledge of conditions that might influence the life period and the economy and safety of the structures. The information obtained at Norris was of considerable value in the design and construction of Hiwassee Dam and similar benefits were realized at Fontana Dam from the investigations at Hiwassee.

The Superpave specifications and equipment, introduced in 1993, represented a major advancement with respect to offering a better understanding of the behavior and characteristics of asphalt binders based on their rheological properties. However, the Superpave high-temperature test protocol has been shown to be inadequate for characterizing the high-temperature behavior (rutting resistance) of asphalt binders, particularly polymer modified ones. Recently, a specification based on the Multiple Stress Creep Recovery (MSCR) test has been proposed to address the shortcomings of the Superpave high-temperature binder specifications. This study aims to investigate the merits of implementing the MSCR test and specification as a replacement for the conventional high-temperature testing in the Performance Graded (PG) system. A statistical analysis was conducted on a dataset from Indiana Department of Transportation (INDOT) to see how MSCR and PG procedures differ in grading different binders used in the state. In addition, an experimental study was conducted using seventeen different modified and unmodified binders. In addition to binder tests, seven of the binders were selected to conduct asphalt mixture tests such as dynamic modulus and flow

number. The results confirm that the MSCR test is a suitable replacement for the current PG high temperature test since it provides a better tool to rank modified asphalt binders as well as unmodified ones. That is, creep compliance from the MSCR test more fundamentally represents binder behavior at high temperatures compared to the PG rutting parameter. In addition, the very simplified approach, known as grade-bumping, used in the current PG system to account for high traffic levels and low speed limits can be eliminated when using the MSCR test. The MSCR test also provides a better coefficient of correlation (at both stress levels) with flow number test results than the PG rutting parameter, again indicating that it more accurately reflects binder performance at high temperatures.

Provides information from around the world on creep in multiple high-temperature metals, alloys, and advanced materials.

Nonlinear Creep and Creep Recovery of Die-cast Aluminum AlloysCreep and Creep-recovery of Plain Concrete Under High Compressive Stresses04 - Long Creep-recovery Behavior of Bamboo-based Products

This book focuses on Creep in Ceramics. The book consists of two parts. In part A general knowledge of creep in ceramics is considered, while part B specifies creep in technologically important ceramics, namely creep in oxide ceramics, carnides and nitrides. While covering all relevant information regarding raw materials and characterization of creep in ceramics, the book also summarizes most recent innovations and developments in this field as a result of extensive literature search.

Although dynamical mechanical analysis or spectroscopy has left the domain of the rheologist and has become a prevalent tool in the analytical laboratory, it is still common to hear, "What is DMA, and what will it tell me?" or "I think I could use a DMA, but I cannot justify its cost." Previously, the novice in the field had to sort through texts on thermal analysis, rheology, and materials science just to find basic information — until now.

Rheology of Semisolid Foods comprehensively covers the rheological behaviors and rheological testing of semisolid foods. Individual chapters focus on semisolid food structure, rheological and sensory behaviors, testing of various semisolid food behaviors, and factors that impact those behaviors. Special concentration is given to the relationships among semisolid food structures and mechanical properties and textures. The second section of this work presents a series of case studies on acid milk gels and yogurt which provide a practical illustration of the concepts presented in the preceding chapters, allowing readers to gain both conceptual knowledge of semisolid food rheology and an understanding of how that knowledge can be applied to a food system of choice. Individual components, processing parameters, and storage conditions can dramatically impact food functional properties and textures. Changing any of these factors can cause significant microstructural alterations resulting in undesirable changes in product stability, functionality and texture. The lack of knowledge of how these factors impact the final food properties makes development of new food products a process of empirical trial rather than intentional design. A fundamental understanding food structure, function and texture relationships is critical for targeted design of food products. This text is a valuable reference for researchers looking to gain an understanding of how rheology works in semisolid food design and processing.

"It is true that "Nothing is more practical than a theory" Provided - however - That the assumptions on which the theory is founded

Are well understood. - But, indeed, engineering experience shows that "Nothing can be more disastrous than a theory When applied to a real problem Outside of the practicailimits of the assumptions made", Because of an homonymous identity With the problem under consideration. " (J. T. P.) The primary objective of this work is to present the theories of analytical and optical isodynes and the related measurement procedures in a manner com patible with the modem scientific methodology and with the requirements of modem technology pertaining to the usefulness of the stress analysis proce dures. The selected examples illustrate some major theses of this work and demonstrate the particular efficiency of the isodyne methods in solving the technologically important problems in fracture mechanics and mechanics of composite structures including new materials. To satisfy this objective it was necessary to depart from the common practice of presenting theories and techniques of experimental methods as a compatible system of equations and procedures without mentioning the tacitly accepted assumptions and their influence on the theoretical admissibility of analytical expressions and the reliability of the experimental or analytical results. It was necessary to design a more general frame of reference which could allow to assess the scientific correctness of isodyne methods and the reliability of experimental results.

This publication presents additional refractory-ceramic property data to supplement those published in the first edition of the Materials Selection Handbook, Is sued in October, 1963, as RTD-TDR-63-4102. The materials covered are nonmetallic inorganic crystalline materials with melting points above 273 deg F (150 deg C), including intermetallic compounds and excluding glass, carbon, and graphite. The data are from literature published in 1961 and 1962. This technical documentary report has been reviewed and is approved.

deformation and the post-creep monotonic tensile behavior.

The proliferation of technological capability, miniaturization, and demand for aerial intelligence is pushing unmanned aerial systems (UAS) into the realm of a multi-billion dollar industry. This book surveys the UAS landscape from history to future applications. It discusses commercial applications, integration into the national airspace system (NAS), System function, operational procedures, safety concerns, and a host of other relevant topics. The book is dynamic and well-illustrated with separate sections for terminology and web- based resources for further information.

The rheo-optical behavior of PAN homopolymer film has been investigated by means of creep and creep recovery experiments with simultaneous measurements of birefringence changes. A progressive change in shape of the creep curve in a log-log plot of compliance vs time is seen: from very flat and gradual to more S-shaped both with increasing temperature, and with increasing stress at the higher temperatures. This S-shaped curve can be identified with the cold-drawing phenomenon, even though no neck formation was seen. Creep recovery is more complete at lower temperatures and after lower final strains in the creep experiment. Most of the recovery is instantaneous; only a very small amount of further time-dependent recovery is observed. At higher temperatures and higher strains, creep seems to involve

permanent changes in the solid-state structure; these produce a permanent set which is not recoverable even on heating to higher temperatures. The creep and creep recovery therefore cannot be properly described in terms of the laws of simple viscoelasticity. The rheo-optical behavior of this polymer is clearly more complex than that of PVC, which has been investigated previously. Some speculations regarding the solid-state structure of PAN are presented, based primarily on the birefringence results. (Author).

DIVPioneering presentation of basic theory, experimental methods and results, solution of boundary value problems. Six appendices. Updated bibliography. /div

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