Microencapsulated Phase Change Materials Pcm For | 3a86b780eb417d3058590c478dfc703

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Mechanics of Transformation Toughening and Related Topics
Fracture and Size Effect in Concrete and Other Quasibrittle Materials
Green Buildings and Sustainable Engineering
International Congress on Polymers in Concrete (ICPIC 2018)
Sustainable Buildings Applications of Encapsulation and Controlled Release
Handbook of Thermal Science and Engineering
Handbook of Fibrous Materials, 2 Volumes
Microencapsulation of Food Ingredients
Sustainable Phase Change and Polymeric Water Absorbent Materials
Thermal Energy Storage with Phase Change Materials
Characterization of Polymers and Microencapsulated Phase Change Materials Used for Thermal Energy Storage in Buildings
Mechanics of Time-Dependent Materials and Processes in Conventional and Multifunctional Materials, Volume 3
Heat and cold storage with PCM
Thermal Energy Storage
Thermal Performance of Microencapsulated Phase Change Material Slurry
Early-Age Temperature Development in Concrete Pavements Containing Microencapsulated Phase Change Materials
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A Practical Guide to Microstructural Analysis of Cementitious Materials

During the last two decades many research and development activities related to energy have concentrated on efficient energy use and energy savings and conservation. In this regard, Thermal Energy Storage (TES) systems can play an important role, as they provide great potential for facilitating energy savings and reducing environmental impact. Thermal storage has received increasing interest in recent years in terms of its applications, and the enormous potential it offers both for more effective use of thermal equipment and for economic, large-scale energy substitutions. Indeed, TES appears to provide one of the most advantageous solutions for correcting the mismatch that often occurs between the supply and demand of energy. Despite this increase in attention, no book is currently available which comprehensively covers TES. Presenting contributions from prominent researchers and scientists, this book is primarily concerned with TES systems and their applications. It begins with a brief summary of general aspects of thermodynamics, fluid mechanics and heat transfer, and then goes on to discuss energy storage technologies, environmental aspects of TES, energy and exergy analyses, and practical applications. Furthermore, this book provides coverage of the theoretical, experimental and numerical techniques employed in the field of thermal storage. Numerous case studies and illustrative examples are included throughout. Some of the unique features of this book include: * State-of-the art descriptions of many facets of TES systems and applications * In-depth coverage of exergy analysis and thermodynamic optimization of TES systems * Extensive new material on TES technologies, including advances due to innovations in sensible- and latent-energy storage * Key chapters on environmental issues, sustainable development and energy savings * Extensive coverage of practical aspects of the design, evaluation, selection and implementation of TES systems * Wide coverage of TES-system modelling, ranging in level from elementary to advanced * Abundant design examples, case studies and references In short, this book forms a valuable reference resource for practicing engineers and researchers, and a research-oriented text book for advanced undergraduate and graduate students of various engineering disciplines. Instructors will find that its breadth and structure make it an ideal core text for TES and related courses. Human sensory perception of clothing involves a series of complex interactive processes, including physical responses to external stimuli, neuropsychological processes for decoding stimuli through the biosensory and nervous systems inside the body, neural responses to psychological sensations, and psychological processes for formulating preferences and making adaptive feedback reactions. Clothing biosensory engineering is a systematic and integrative way of translating consumers' biological and sensory responses, and psychological feelings and preferences about clothing, into the perceptual elements of design. It is a link between scientific experimentation and commercial application to develop economic solutions to practical technical problems. Clothing biosensory engineering quantifies the decision-making processes through which physics, mathematics, neurophysiological and engineering techniques are applied to optimally convert resources to meet various sensory requirements – visual/thermal/mechanical. It includes theoretical and experimental observations, computer simulations, test methods, illustrations and examples of actual product development. Describes the process of Clothing biosensory engineering in detail Quantity izes the decision making processes applied to optimally convert resources to meet various sensory requirements Includes theoretical and experimental observations and examples of actual product development

PCM Enhanced Building Envelopes presents the latest research in the field of thermal energy storage technologies that can be applied to solar heating and cooling with the aim of shifting and reducing building energy demand. It discusses both practical and technical issues, as well as the advantages of using common phase change materials (PCMs) in...
buildings as a more efficient, novel solution for passive solar heating/cooling strategies. The book includes qualitative and quantitative descriptions of the science, technology and practices of PCM-based building envelopes, and reflects recent trends by placing emphasis on energy storage solutions within building walls, floors, ceilings, façades, windows, and shading devices. With the aim of assessing buildings' energy performance, the book provides advanced modeling and simulation tools as a theoretical basis for the analysis of PCM-based building envelopes in terms of heat storage and transfer. This book will be of interest to all those dealing with building energy analysis such as researchers, academics, students and professionals in the fields of mechanical and civil engineering and architectural design. In the wake of energy crisis due to rapid growth of industries, the efficient heat transfer could play a vital role in energy saving. Industries, household equipment, transportation, offices, etc., are all dependent on heat exchanging equipment. Considering this, the book has incorporated different chapters on heat transfer phenomena, analytical and experimental heat transfer investigations, heat transfer enhancement and applications. This book proceeds the proceedings of the International Conference on Green Buildings and Sustainable Engineering (GBSE 2019), which focused on the theme “Ecotechnological and Digital Solutions for Smart Cities”. The papers included address all aspects of green building design and sustainability practices in civil engineering, and focus on ways and means of reducing pollution and degradation of the environment through efficient usage of energy and water. The book will prove a valuable reference resource for researchers, practitioners, and policy makers.

Advances in Thermal Energy Storage Systems, 2nd edition, presents a fully updated comprehensive analysis of thermal energy storage systems (TES) including all major advances and developments since the first edition published. This very successful publication provides readers with all the information related to TES in one resource, along with a variety of applications across the energy/power and construction sectors, as well as new to this edition, the transport industry. After an introduction to TES systems, editor Dr. Prof. Luisa Cabeza and her team of expert authors consider the source, design and operation of the use of water, molten salts, concrete, aquifers, boresoles and a variety of phase-change materials for TES systems, before analysing and simulating underground TES systems. This edition benefits from 5 new chapters covering the most advanced technologies including sorption systems, thermodynamic and dynamic modelling as well as applications to the transport industry and the environmental and economic aspects of TES. It will benefit researchers and academics of energy systems and thermal energy storage, construction engineering academics, engineers and practitioners in the energy and power industry, as well as architects of plants and storage systems and R&DM. Includes 5 brand new chapters covering Sorption systems, Thermodynamic and dynamic models, applications to the transport sector, environmental aspects of TES and economic aspects of TES. All existing chapters are updated and revised to reflect the most recent advances in the research and technologies of the field. Reviews heat storage technologies, including the use of water, molten salts, concrete and boresoles in one comprehensive resource. Describes latent heat storage systems and thermochemical heat storage. Includes information on the monitoring and control of thermal energy storage systems, and considers their applications in residential buildings, power plants and industry. His study aims to reduce the energy consumption of buildings and to provide cost savings to ratepayers. Phase change materials (PCMs) can store thermal energy in the form of latent heat when subjected to temperatures exceeding their melting point by undergoing a phase transition from solid to liquid state. Reversibly, PCMs can release this thermal energy when the system temperature falls below their solidification point. The goal in implementing composite PCM walls is to significantly reduce and time-shift the maximum thermal load on the building in order to reduce and smooth out the electricity demand for heating and cooling. This Ph.D. thesis aims to develop a set of thermal design methods and tools for exploring the use of PCM-composite building envelopes and for providing design rules for their practical implementation. First, detailed numerical simulations were used to show that the effective thermal conductivity of core-shell-matrix composites depended only on the volume fraction and thermal conductivity of the constituent materials. The effective medium approximation reported by Felske (2004) was in very good agreement with numerical predictions of the effective thermal conductivity. Second, a carefully validated transient thermal model was used to simulate microencapsulated PCM-composite walls subjected to diurnal or annual outdoor temperature and solar radiation flux. It was established that adding microencapsulated PCM to concrete walls both substantially reduced and delayed the thermal load on the building. Several design rules were established, most notably, (i) increasing the volume fraction of microencapsulated PCM within the wall increases the energy savings but at the potential expense of mechanical properties [1], (ii) the phase change temperature leading to the maximum energy and cost savings should equal the desired indoor temperature regardless of the climate conditions, (iii) microencapsulated PCM-concrete walls have the best energetic performance in climates where the outdoor temperature oscillates around the desired indoor temperature, (iv) microencapsulated PCM offers the largest energy and cost savings when embedded in South- and West-facing walls and during the summer months in San Francisco and Los Angeles, CA. Third, a novel experimental method was developed to rapidly quantitatively characterize the thermal performance and potential energy savings of composite materials containing phase change materials (PCM) based on a figure of merit termed the energy indicator (EI). The method featured (i) commonly used specimen geometry, (ii) straightforward experimental implementation, and (iii) sensitivity to relevant design parameters including PCM volume fraction, enthalpy of phase change, composite effective thermal conductivity, and specimen dimensions. Finally, the widely-used admittance method was extended to account for the effects of phase change on the thermal load passing through PCM-composite building walls subjected to realistic outdoor temperature and solar radiation flux. The speed and simplicity of the admittance method could facilitate the design and evaluation of the energy benefits of PCM-composite walls through user-friendly design software for a wide range of users. Fracture and Size Effect in Concrete and Other Quasibrittle Materials is the first in-depth text on the application of fracture mechanics to the analysis of failure in concrete structures. The book synthesizes a vast number of recent research results in the literature to provide a comprehensive treatment of the topic that does not give merely the facts - it provides true understanding.
The many recent results on quasibrittle fracture and size effect, which were scattered throughout many periodicals, are compiled here in a single volume. This book presents a well-rounded discussion of the theory of size effect and scaling of failure loads in structures. The size effect, which is the most important practical manifestation of fracture behavior, has become a hot topic. It has gained prominence in current research on concrete and quasibrittle materials. The treatment of every subject in Fracture and Size Effect in Concrete and Other Quasibrittle Materials proceeds from simple to complex, from specialized to general, and is as concise as possible using the simplest level of mathematics necessary to treat the subject clearly and accurately. Whether you are an engineering student or a practicing engineer, this book provides you with a clear presentation, including full derivations and examples, from which you can gain real understanding of fracture and size effect in concrete and other quasibrittle materials.

Microencapsulation is a rapidly growing area of research and product development. The Handbook of Encapsulation and Controlled Release covers the entire field, presenting the fundamental concepts and applications of smart nanoconcretes and cement-based materials. It discusses previous research into optimizing the integration of PCMs into surrounding walls (gypsum board and interior plaster products), trombe walls, ceramic floor tiles, concrete elements (walls and pavements), windows, concrete and brick masonry, underfloor heating, ceilings, thermal insulation and furniture, indoor appliances. Based on the phase change state, PCMs fall into three groups: solid–solid PCMs, solid–liquid PCMs and liquid–gas PCMs. Of these the solid–liquid PCMs, which include organic PCMs, inorganic PCMs and eutectics, are suitable for thermal energy storage. The process of selecting an appropriate PCM is extremely complex, but crucial for thermal energy storage. The potential PCM should have a suitable melting temperature, and the desirable heat of fusion and thermal conductivity specified by the practical application. Thus, the methods of measuring the thermal properties of PCMs are key. With suitable PCMs and the correct incorporation method, latent heat thermal energy storage (LHTES) can be economically efficient for heating and cooling buildings. However, several problems need to be tackled before LHTES can reliably and practically be applied. The full set of proceedings also includes volumes on Mechanics of Time-Dependent Materials and Processes in Conventional and Multifunctional Materials, Cement and Concrete, and Thermomechanics and Infrared Imaging, and Engineering Applications of Residual Stress. Cement-based materials have been used by humans nearly since the dawn of civilization. The Egyptians used lime and gypsum cement to bind their aggregate materials, mud and straw, resulting in bricks that are used for building their famous Egyptian pyramids (between 3000 and 2500 BC). Hydrated cement is a cement material bonded together with water and used for building construction; it is characterized by acceptable chemical, physical, thermal, mechanical, and structural stability. It plays a main role in the creation of vessels for storage, roads to travel on, weather-resistant structure for protection, inert hard stabilizer for hazardous wastes, and so on. Due to the composition of these materials and their advantages, it has been practiced in different applications. Cement is an essential component of making concrete, the single most prevalent building material used worldwide for construction, skyscrapers, highways, tunnels, bridges, hydraulic dams, and railway ties. Besides their numerous desired properties, there are some undesirable features. To overcome these disadvantages, several studies were established to prepare, improve, and evaluate innovative cement-based materials. Despite its oldness and deep research, every year several methods and materials evolve and so do cement technology. This book intends to provide a comprehensive overview on recent advances in the evaluation of these materials. The Handbook of Encapsulation and Controlled Release covers the entire field, presenting the fundamental processes involved and exploring how to use those processes for different applications in industry. Written at a level comp
access free microencapsulated phase change materials pcm for energy and therefore the so called annual solar load fraction will be very low. in case of solar energy, both short term and long term energy storage systems can be used which is intermittent such as solar energy. the use of intermittent energy sources is likely to grow. if more and more solar energy is to be used for domestic and industrial energy demand. the energy storage can even out this imbalance and thereby help in savings of capital costs. energy storage is all the more important where the energy source saving of premium fuels and makes the system more cost effective by reducing the wastage of energy. in most systems there is a mismatch between the energy supply and electronic systems thermal management, solar thermal power plant design and many others. additional future research directions and challenges are also discussed. energy over the past 10 years to include the development of high efficiency building materials to reduce heating and cooling needs, smart material design for clothing, portable electronic systems thermal management, solar thermal power plant design and many others. additional future research directions and challenges are also discussed. energy storage not only plays an important role in conserving the energy but also improves the performance and reliability of a wide range of energy systems. energy storage, leads to saving of premium fuels and makes the system mora cost effective by reducing the wastage of energy. in most systems there is a mismatch between the energy supply and energy demand. the energy storage can even out this imbalance and thereby help in savings of capital costs. energy storage is all the more important where the energy source is intermittent such as solar energy. the use of intermittent energy sources is likely to grow. if more and more solar energy is to be used for domestic and industrial applications then energy storage is very crucial. if no storage is used in solar energy systems then the major part of the energy demand will be met by the back-up or auxiliary energy and therefore the so called annual solar load fraction will be very low. in case of solar energy, both short term and long term energy storage systems can be used which
can adjust the phase difference between solar energy supply and energy demand and can match seasonal demands to the solar availability respectively. Thermal energy storage can lead to capital cost savings, fuel savings, and fuel substitution in many application areas. Developing an optimum thermal storage system is as important an area of research as developing an alternative source of energy. The study of fracture mechanics of concrete has developed in recent years to the point where it can be used for assessing the durability of concrete structures and for the development of new concrete materials. The last decade has seen a gradual shift of interest toward fracture studies at increasingly smaller sizes and scales. Concrete Fracture: A Multiscale Approach explores fracture properties of cement and concrete based on their actual material structure. Concrete is a complex hierarchical material, containing material structural elements spanning scales from the nano- to micro- and meso-level. Therefore, multi-scale approaches are essential for a better understanding of mechanical properties and fracture in particular. This volume includes various examples of fracture analyses at the micro- and meso-level. The book presents models accompanied by reliable experiments and explains how these experiments are performed. It also provides numerous examples of test methods and requirements for evaluating quasi-brittle materials. More importantly, it explores a new modeling approach based on multiscale integration potential and examines the related experimental challenges facing research engineers and building professionals. The book's comprehensive coverage is poised to encourage new initiatives for overcoming the difficulties encountered when performing fracture experiments on cement at the micro-size scale and smaller. The author demonstrates how the obtained results can fit into the larger picture of the material science of concrete—particularly the design of new high-performance concrete materials which can be put to good use in the development of efficient and durable structures. This Handbook provides researchers, faculty, design engineers in industrial R&D, and practicing engineers in the field concise treatments of advanced and more recently established topics in thermal science and engineering, with an important emphasis on micro- and nanoscale systems, not covered in earlier references on applied thermal science, heat transfer or relevant aspects of mechanical/chemical engineering. Major sections address new developments in heat transfer, transport phenomena, single- and multiphase flows with energy transfer, thermal-bioengineering, thermal radiation, combined mode heat transfer, coupled heat and mass transfer, and energy systems. Energy transport at the macro-scale and micro/nano-scales is also included. The internationally recognized team of authors adopt a consistent and systematic approach and writing style, including ample cross reference among topics, offering readers a user-friendly knowledgebase greater than the sum of its parts, perfect for frequent consultation. The Handbook of Thermal Science and Engineering is ideal for academic and professional readers in the traditional and emerging areas of mechanical engineering, chemical engineering, aerospace engineering, bioengineering, electronics fabrication, energy, and manufacturing concerned with the influence thermal phenomena. The ever-increasing information technology heat load and data center cooling energy are the main reasons to investigate the performance of microencapsulated phase change slurry over other heat transfer fluids. In recent years, more effort is being made on the development of a new technique to use the phase change materials as pump-able heat transfer fluid and as heat storage for data centers using Phase Change Materials for Data Centers. This Handbook reviews the current state of fibrous materials and provides a unified source of information covering the entire spectrum of energy, one of the most significant issues humanity has to face. This comprehensive book describes traditional and novel energy systems, from single generation to multi-generation, also covering theory and applications. In addition, it also presents high-level coverage on energy policies, strategies, environmental impacts and sustainable development. No other published work covers such breadth of topics in similar depth. High-level sections include Energy Fundamentals, Energy Materials, Energy Production, Energy Conversion, and Energy Management. Offers the most comprehensive resource available on the topic of energy systems Presents an authoritative resource authored and edited by leading experts in the field Consolidates information currently scattered in publications from different research fields (engineering as well as physics, chemistry, environmental sciences and economics), thus ensuring a common standard and languageEdited by a leading expert in the field with contributions from experienced researchers in fibers and textiles, this handbook reviews the current state of fibrous materials and provides a broad overview of their use in research and development. Volume One focuses on the classes of fibers, their production and characterization, while the second volume concentrates on their applications, including emerging ones in the areas of energy, environmental science and healthcare. Unparalleled knowledge of high relevance to academia and industry. The use of renewable heat decreases the consumption of fossil resources, although its usage is intermittent and usually does not match the demand. A proper thermal energy storage system design can eliminate this problem by reducing the consumption of non-renewable resources and improving energy efficiency where used. In buildings, thermal energy storage using phase change materials (PCM) is a useful tool to achieve reduction in energy consumption. These can be incorporated into...
passive or/and active systems. Thus, a proper selection of materials and extensive characterization for its usage in thermal energy storage is critical for new construction systems and for those already constructed. This Thesis is divided in two blocks and presented as a compendium of published articles in scientific journals indexed in Materials, Engineering, and Energy areas. The emphasis is made in the chemical, physical, thermal, mechanical and environmental characterization of PCM, MPCM (microencapsulated phase change materials), and PCS (phase change slurries). The main purpose is to perform an exhaustive characterization of this kind of materials because several scientific studies have highlighted that PCM mixed with construction materials can suffer leakage. Polymeric encapsulation is an alternative for retaining PCM inside building materials, resulting in a system named MPCM. - Macroscopic samples: the nanoindentation technique has been used to characterize thermoplastics that, so far, have had few precedents. As mechanical properties of materials are an important criterion for their selection and nanoindentation allows their evaluation, we have studied the hardness and elastic modulus of different polymeric materials through Loubet and Oliver & Pharr methodologies, to discern which is the most suitable concerning the viscoelastic properties. The obtained values by Oliver & Pharr method are based on the unloading curves; in case of Loubet methodology, these values are a function of the penetration depth, the indentation. Also, we have studied the mechanical changes that occur when a polymer that contains a flame retardant is immersed in PCM. It has been observed that using Mg(OH)2 increases rigidity and mechanical strength while reducing the degradation effect and improving the properties against fire. This block contains two scientific published papers. - Microscopic samples: This block is based on MPCM studies. A review of publications related to PCM, MPCM and slurries (PCS) (same shell and different PCM; different shell and same PCM; same shell and same PCM, but different encapsulation ratios) was prepared. Then, the evaluation of the chemical, physical, thermal, mechanical, and environmental properties of different MPCM and PCS samples was performed, concluding that AFM is a useful tool to characterize the stiffness and Young's modulus of MPCM. Because temperature is a key parameter in PCM systems, AFM experiments were carried out at different temperatures, in order to simulate the PCM in solid and/or liquid state. PCS samples were observed using SEM device coupled to a cryogenic system. Besides, environmental properties of PCS have been studied by gas chromatography (VOC's). In addition, PCS were cycled for the evaluation of the polymeric shell durability after pumping the sample several cycles. Also, the chemical and thermophysical properties before and after pumping the sample were compared. Finally, due to the thermal behavior results of PCS in some performed studies, and depending on the liquid or dried PCS sample, the optimum conditions by means thermogravimetric analysis were evaluated. The second block contains five scientific published articles, one article under review after its first revision, one article finished without being submitted to a journal, and one unfinished research. Finally, the contribution in the state of the art of this PhD Thesis related with thermal energy storage in buildings using PCM, MPCM, and PCS is presented.The years 2006 and 2007 mark a dramatic change of peoples view regarding c- mate change and energy consumption. The new IPCC report makes clear that - mankind plays a dominant role on climate change due to CO emissions from en- 2 ergy consumption, and that a significant reduction in CO emissions is necessary within decades. At the same time, the supply of fossil energy sources like coal, oil, and natural gas becomes less reliable. In spring 2008, the oil price rose beyond 100 $/barrel for the first time in history. It is commonly accepted today that we have to reduce the use of fossil fuels to cut down the dependency on the supply countries and to reduce CO emissions. The use of renewable energy sources and 2 increased energy efficiency are the main strategies to achieve this goal. In both strategies, heat and cold storage will play an important role. People use energy in different forms, as heat, as mechanical energy, and as light. With the discovery of fire, humankind was the first time to supply heat and light when needed. About 2000 years ago, the Romans started to use ceramic tiles to store heat in under floor heating systems. Even when the fire was out, the room stayed warm. Since ancient times, people also know how to cool food with ice as cold storage.Presenting breakthrough research pertinent to scientists in a wide range of disciplines-from medicine and biotechnology to cosmetics and pharmacy-this Second Edition provides practical approaches to complex formation problems encountered in the development of particulate delivery systems at the micro- and nano-size level. Completely revised and eSince the benefit of stress-induced tetragonal to monoclinic phase transformation of confined tetragonal zirconia particles was first recognized in 1975, the phenomenon has been widely studied and exploited in the development of a new class of materials known as transformation toughened ceramics (TTC). In all materials belonging to this class, the microstructure is so controlled that the tetragonal to monoclinic transformation is induced as a result of a high applied stress field rather than as a result of cooling the material below the martensitic start temperature. The significance of microstructure to the enhancement of thermomechanical properties of TTC is now well understood, as are the mechanisms that contribute beneficially to their fracture toughness. The micromechanics of these mechanisms have been extensively studied and are therefore presented here in a cogent manner. The authors also review dislocation formalism for the modelling of cracks and Eshelby's technique. In compiling this monograph the authors present the most up-to-date and complete review of the field and include several topics which have only recently been fully investigated.Today, the application of phase change materials (PCMs) has developed in different industries, including the solar cooling and solar power plants, photovoltaic electricity systems, the space industry, waste heat recovery systems, preservation of food and pharmaceutical products, and domestic hot water. PCMs use the principle of latent heat thermal storage to absorb energy in large quantities when there is a surplus and release it when there is a deficit. This promising technology has already been successfully implemented in many construction projects. The aim of this book is to assist the scientists and to provide the reader with a comprehensive overview of the properties that characterize the phase change materials from theoretical and experimental perspectives with a focus on their technological applications. The present status and future perspectives of phase change material are discussed. The efficiency of a pumped heat-transfer system can be greatly increased by incorporating a phase-change material (PCM). Because PCMs have greater thermal capacity than the carrier fluid, owing to their latent heat of phase change, they can increase the amount of heat transfer at equivalent volumetric flow in a heat exchanging environment. These materials tend
to clog heat-transfer and distribution pipes, but previous research has indicated that the problem may be solved by encapsulating the PCMs. This report documents an investigation of the thermophysical properties of PCMs enclosed in micro-scale capsules. The study also addressed microcapsule durability against abrasion and chemicals, and the relation of fluid temperature and particle volume fraction on viscosity. The results of this research show that the total heat capacity of microencapsulated PCM (MPCM) slurries is enhanced significantly, even when using low volume fractions. MPCM slurries have potential to decrease costs and improve energy efficiency for all pumped cooling applications. This book has been written to represent the efficient applications of sustainability upon building designs. The book intends to illustrate various techniques of action of sustainability on building conceptions. The book is divided into four parts and eight chapters. Part I “Introduction into Target Theme” includes a chapter with title “Introductory Chapter.” It makes an overview of the meaning and the target of sustainable building and sustainable building material. Part II “Sustainable Building Design, Process, and Management” discusses many forms and concepts of sustainable building and includes three chapters. Part III “Sustainable Building by Using Energy Efficiency in Building Design” includes one chapter. Part IV “Sustainability in Building Materials: Study Cases” includes three chapters. Çukurova University, Turkey in collaboration with Ljubljana University, Slovenia and the International Energy Agency Implementing Agreement on Energy Conservation Through Energy Storage (IEA ECES IA) organized a NATO Advanced Study Institute on Thermal Energy Storage for Sustainable Energy Consumption – Fundamentals, Case Studies and Design (NATO ASI TESSEC), in Cesme, Izmir, Turkey in June, 2005. This book contains manuscripts based on the lectures included in the scientific programme of the NATO ASI TESSEC. This study investigates experimentally and numerically the addition of microencapsulated phase change materials (PCMs) into concrete pavements at early ages to limit (i) temperature rise caused by cement-water hydration, (ii) cooldown rate, and (iii) the associated risk of thermal cracking. First, the effect of water-reducing admixture (WRA) on the heat generation rate from cement hydration was quantified using isothermal calorimetry. Second, large cubic PCM-mortar composite specimens representative of a common pavement geometry were prepared and placed in an environmental test chamber simulating realistic diurnal conditions. The results showed that the presence of PCM can reduce considerably the temperature rise and cooldown rate across the cementitious composite section within the first 24 hours following placement provided the PCM melting temperature is selected carefully. This was in spite of the fact that the lower thermal conductivity of PCM-composites inhibited heat dissipation. A transient 1D thermal model of pavement section was developed to simulate the temperature evolution and the rate of change in temperature within PCM-mortar composite sections. Good agreement was found between model predictions and experimental measurements. In addition, a parametric study was carried out to assess the effects of the PCM melting characteristics (temperature, temperature window, latent heat) on local temperature in PCM-mortar composites. The constitutive relationships and the numerical model developed as part of this study can be used to inform the design of concrete pavements containing PCMs for early-age crack resistance.