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This chapter describes the elastic qualities of advanced fibre-reinforced composites, in terms of characterization, measurement and prediction from the basic constituents, i.e. the fibre and matrix. The elastic analysis comprises applying micromechanics approaches to predict the lamina elastic properties from the basic constituents, and using classical lamination theory to predict the elastic properties of composite materials composed of several laminae stacked at different orientations. Examples are given to illustrate the theoretical analysis and give a full apprehension of its prediction capability. The last section provides an overview on identification methods for elastic proprieties based on full-field measurements. It is shown that these methodologies are very convenient for elastic characterization of anisotropic and heterogeneous materials.
Chapters 16 and discuss the development of the advanced polymer composite material applications in bridge engineering. They demonstrate the innovative types of components and structures which have been developed from FRP

composite materials and the most advantageous way to employ composites in bridge engineering. Given the importance of bridge infrastructure, the discussion of this topic has been split over two chapters. This chapter focuses on the type of FRP composite materials used in bridge engineering, their in-service properties and their applications in bridge enclosures and the rehabilitation of reinforced and prestressed concrete bridge beams and columns. covers rehabilitation of metallic bridge structures, all FRP composite bridges and bridges built with hybrid systems.

This chapter discusses the use of vinylester resin as a matrix in polymer composite materials to be used in civil engineering applications. The chapter begins by discussing the increasing trend of composite development and use in civil engineering along with the related reasons. It then reviews the chemistry of vinylester resins together with their mechanical and chemical properties as well as the applications of vinylester resin and composites in the construction industry. The chapter includes indications on future applications of vinylester-based fibre-reinforced composites along with a section devoted to sources of further and relevant information.

Strengthening of Concrete Structures Using Fiber Reinforced Polymers (FRP): Design, Construction and Practical Applications presents a best practice guide on the structural design and strengthening of bridge structures using advanced Fiber Reinforced Polymer (FRP) composites. The book briefly covers the basic concepts of FRP materials and composite mechanics, while focusing on practical design and construction issues, including inspection and quality control, paying special attention to the differences in various design codes (US, Japan, and Europe) and recommendations. At present, several design guides from the US, Japan, and Europe are available. These guidelines are often inconsistent and do not cover all necessary design and inspection issues to the same degree of detail. This book provides a critical review and comparison of these guidelines, and then puts forward best practice recommendations, filling a significant gap in the literature, and serving as an important resource for engineers, architects, academics, and students interested in FRP materials and their structural applications. Written from a practitioner's point-of-view, it is a valuable design book for structural engineers all over the world. Includes a large quantity of design examples and structural software to facilitate learning and help readers perform routine design Provides recommendations for best practices in design and construction for the strengthening of bridge structures using advanced fiber-reinforced polymer (FRP) composites Presents comprehensive guidelines on design, inspection, and quality control, including laboratory and field testing information

Sustainable energy contributes to reducing the dependence on the use of fossil fuel resources, thus providing the opportunity to reduce greenhouse gases. The renewable technologies may be divided into three generations. The first commenced in the nineteenth century and was hydro-, biomass- and geothermal-power. The second stage started during the 1980s and consists of wind power, tidal and wave power, and solar power. The third stage is under development and is gasification, bio-refinery and ocean power. This chapter describes and discusses the second generation of renewable technologies and the phase to which each has currently progressed; these developments have been rapid. It also forms an introduction to which considers the significance of equipment made from advanced polymer composite materials in obtaining sustainable energy.

Modern structural applications of composite materials are dictated by the processing methods available. In this chapter, we introduce recent developments related to the manufacturing of composites in civil engineering applications using vacuum assisted resin transfer molding, pultrusion, and automated fiber placement.

In this chapter, we report the findings of experimental investigations conducted on durability of glass fiber-reinforced polymer (GFRP) composites with and without the addition of montmorillonite nanoclay. First, neat and nanoclay-added epoxy systems were characterized to evaluate the extent of clay platelet exfoliation and dispersion of nanoclay. GFRP composite panels were then fabricated with neat/modified epoxy resin and exposed to six different conditions, i.e. hot-dry/wet, cold-dry/wet, ultraviolet radiation and alternate ultraviolet radiation–-condensation. Room temperature condition samples were also used for baseline consideration. An improved dispersion of nanoclay and exfoliation of clay platelets were observed in 2wt% of epoxy samples. Weight change, discoloration and significant reduction in properties were observed in all conditioned GFRP samples. However, addition of nanoclay considerably improved the durability of GFRP samples as evident from the mechanical and micrographical results in comparison to neat samples subjected to similar conditions.

Fibre-reinforced plastic (FRP) composite materials are basically of two types. The first type is short fibres reinforced in a plastic matrix, and the other type continuous (long) fibres reinforced in a plastic matrix. The exact distinction between a short and a continuous fibre is discussed in Chapter 1. Continuous fibre-reinforced composite materials are referred to by many labels: FRP composites, advanced composites, fibrous composites, composite materials or simply composites. These terms are now generally accepted to mean the same type of material, namely, continuous fibre reinforced in plastic. In this book, the term fibrous composites is used to define a continuous fibre reinforced in plastic. Fibrous composites are presently in use for a variety of structural applica tions, and may offer an alternative to conventional metallic materials. The behaviour of fibrous composites subjected to a loading condition is very different from that of a metallic isotropic material. Therefore, 'new' analytical and testing methods are required to analyse a structural element and sections made from layered fibrous composites. There are a number of books written on the subject of composite materials. All of these are excellent in their content and achieve the authors' objectives.

This volume highlights the latest advances, innovations, and applications in the field of FRP composites and structures, as presented by leading international researchers and engineers at the 10th International Conference on Fibre-Reinforced Polymer (FRP) Composites in Civil Engineering (CICE), held in Istanbul, Turkey on December 8-10, 2021. It covers a diverse range of topics such as All FRP structures; Bond and interfacial stresses; Concrete-filled FRP tubular members; Concrete structures reinforced or pre-stressed with FRP; Confinement; Design issues/guidelines;

Durability and long-term performance; Fire, impact and blast loading; FRP as internal reinforcement; Hybrid structures of FRP and other materials; Materials and products; Seismic retrofit of structures; Strengthening of concrete, steel, masonry and timber structures; and Testing. The contributions, which were selected by means of a rigorous international peer-review process, present a wealth of exciting ideas that will open novel research directions and foster multidisciplinary collaboration among different specialists.

This chapter discusses the epoxy resins which, thanks to their good and versatile properties, can be considered nowadays the most important class of thermosetting polymers. In particular the chapter first reviews both the epoxy resins commonly available on the market, including a new class of bio-derived epoxy resins, and the most-used curing agents. it then describes the principal characteristics of the epoxy resins and how it is possible to enhance them by adding several fillers to the epoxy system. Finally, the chapter analyzes the main engineering fields in which epoxy resins find application today and their possible future utilization.

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.

Fibre reinforced polymer (FRP) composites are used in almost every type of advanced engineering structure, with their usage ranging from aircraft, helicopters and spacecraft through to boats, ships and offshore platforms and to automobiles, sports goods, chemical processing equipment and civil infrastructure such as bridges and buildlings. The usage of FRP composites continues to grow at an impessive rate as these materials are used more in their existing markets and become established in relatively new markets such as biomedical devices and civil structures. A key factor driving the increased applications of composites over the recent years is the development of new advanced forms of FRP materials. This includes developments in high performance resin systems and new styles of reinforcement, such as carbon nanotubes and nanoparticles. This book provides an up-to-date account of the fabrication, mechanical properties, delamination resistance, impact tolerance and applications of 3D FRP composites. The book focuses on 3D composites made using the textile technologies of weaving, braiding, knitting and stiching as well as by z-pinning.

Testing of composite materials can present complex problems but is essential in order to ensure the reliable, safe and cost-effective performance of any engineering structure. This essentially practical book, complied from the contributions of leading professionals in the field, describes a wide range of test methods which can be applied to various types of advanced fibre composites. The book focuses on high modulus, high strength fibre/plastic composites and also covers highly anisotrpoic materials such as carbon, aramid and glass. Engineers and designers specifying the use of materials in structures will find this book an invaluable guide to best practice throughout the range of industrial sectors where FRCs are employed.

To ensure better performance for a range of existing reinforced concrete structures in seismic regions with substandard structural details, seismic retrofit is an economical solution. Hence, this chapter presents some of the available results in which fiber-reinforced polymer (FRP) composites can be used for damage-controllable structures. For example, the performance of existing reinforced concrete structures whose components are vulnerable to shear failure, flexural-compression failure, joint reinforcement bond failure, or longitudinal reinforcement lap splice failure and retrofitted with FRPs is described. Novel concepts of modern constructions with controllability and recoverability using FRP composites are addressed.

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.

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.

Rehabilitation of Concrete Structures with Fiber Reinforced Polymer is a complete guide to the use of FRP in flexural, shear and axial strengthening of concrete structures. Through worked design examples, the authors guide readers through the details of usage, including anchorage systems, different materials and methods of repairing concrete structures using these techniques. Topics include the usage of FRP in concrete structure repair, concrete structural deterioration and rehabilitation, methods of structural rehabilitation and strengthening, a review of the design basis for FRP systems, including strengthening limits, fire endurance, and environmental considerations. In addition, readers will find sections on the strengthening of members under flexural stress, including failure modes, design procedures, examples and anchorage detailing, and sections on shear and torsion stress, axial strengthening, the installation of FRP systems, and strengthening against extreme loads, such as earthquakes and fire, amongst other important topics. Presents worked design examples covering flexural, shear, and axial strengthening Includes complete coverage of FRP in Concrete Repair Explores the most recent guidelines (ACI440.2, 2017; AS5100.8, 2017 and Concrete society technical report no. 55, 2012)

The term liquid composite moulding (LCM) encompasses a family of processes in which a dry fibrous reinforcement is impregnated by a liquid resin inside a sealed cavity. As the understanding and control of these processes improve, their field of application widens. LCM processes can be used as a replacement to decrease the environmental impact and improve the quality of composite parts made via traditional open-mould processes. they can also provide a cost-cutting alternative to prepreg techniques while maintaining a high part quality. This chapter describes the variety of processes blanketed under the class liquid composite moulding and the research advances in the monitoring and simulation of these processes. the subsequent section presents the current usage of LCM techniques in the field of civil engineering, including some case studies, before outlining some future trends and offering sources for further information.

Addresses key topic within bridge engineering, from history and aesthetics to design, construction and maintenance issues. This book is suitable for practicing civil and structural engineers in consulting firms and government agencies, bridge contractors, research institutes, and universities and colleges.

The strengthening of reinforced concrete (RC) structures using advanced fibre-reinforced polymer (FRP) composites, and in particular the behaviour of FRP-strengthened RC structures is a topic which has become very popular in recent years. This popularity has arisen due to the need to maintain and upgrade essential infrastructure in all parts of the world, combined with the well-known advantages of FRP composites, such as good corrosion resistance and ease for site handling due to their light weight. The continuous reduction in the material cost of FRP composites has also contributed to their popularity. While a great amount of research now exists in the published literature on this topic, it is scattered in various journals and conference proceedings. This book therefore provides the first ever comprehensive, state-of-the-art summary of the existing research on FRP strengthening of RC structures, with the emphasis being on structural behaviour and strength models. The main topics covered include: * bond behaviour * flexural and shear strengthening of beams * column strengthening * flexural strengthening of slabs. For each area, the methods of strengthening are discussed, followed by a description of behaviour and failure modes and then the presentation of rational design recommendations, for direct use in practical design of FRP strengthening measures. Researchers, practicing engineers, code writers and postgraduate students in structural engineering and construction materials, as well as consulting firms, government departments, professional bodies, contracting firms and FRP material suppliers will find this an invaluable resource.

This chapter deals with the uses of advanced composite materials in the construction industry. After considering the advantages of using composites and methods of fabrication, it outlines the surprisingly wide range of applications of composites. Examples are given from around the world of components and complete buildings and bridges, railway and other infrastructure, geotechnical applications and pipes for the water sector. Finally a number of more unusual or future possibilities are presented.

Portland cement concrete is a brittle material. The main reason for incorporating fibres into a cement matrix is to improve the cracking deformation characteristics, increasing not only the toughness, impact and tensile strength, but also eliminating temperature and shrinkage cracks. Several different types of fibres have been used to reinforce cement-based materials. This chapter briefly discusses the characteristics of fibre-reinforced concrete (FRC), reporting the effect of the fibres on the physico-chemical and mechanical properties. It also presents some of the recent research and future perspectives of FRC.

Presents state-of-the-art processing techniques and readily applicable knowledge on processing of polymer composites The book presents the advancement in the field of reinforced polymer composites with emphasis on manufacturing techniques, including processing of different reinforced polymer composites, secondary processing of green composites, and post life cycle processing. It discusses the advantages and limitations of each processing method and the effect of processing parameters on the overall performance of the composites. Characterization and applications of reinforced polymer composites are also introduced. Reinforced Polymer Composites: Processing, Characterization and Post Life Cycle Assessment starts off by providing readers with a comprehensive overview of the field. It then introduces them to the fabrication of both short fiber/filler reinforced polymer composites and laminated reinforced polymer composites. Next, it takes them through the processing of polymer-based nanocomposites; the many advances in curing methods of reinforced polymer composites; and post life cycle processing, re-processing, and disposal mechanisms of reinforced polymer composites. Numerous other chapters cover: synthetic versus natural fiber reinforced plastics; characterization techniques of reinforced plastics; friction and wear analysis of reinforced plastics; secondary processing of reinforced plastics; and applications of reinforced plastics. -Presents the latest development in materials, processing, and characterization techniques, as well as applications of reinforced polymer composites -Guides users in choosing the best processing methods to produce polymer composites and successfully manufacture high quality products -Assists academics in sorting out basic research questions and helps those in industry manufacture products, such as marine, automotive, aerospace, and sport goods Reinforced Polymer Composites: Processing, Characterization and Post Life Cycle Assessment is an important book for materials scientists, polymer chemists, chemical engineers, process engineers, and anyone involved in the chemical or plastics technology industry.

Fiber Reinforced Polymers are by no means new to this world. It is only because of our fascination with petrochemical and non-petrochemical products that these wonderful materials exist. In fact, the polymers can be considered and used in the construction and construction repair. The petrochemical polymers are of low cost and are used more that natural materials. The Fiber Reinforced Polymers research is currently increasing and entails a quickly expanding field due to the vast range of both traditional and special applications in accordance to their characteristics and properties. Fiber Reinforced Polymers are related to the improvement of environmental parameters, consist of important areas of research demonstrating high potential and particularly great interest, as civil construction and concrete repair.

This chapter will introduce advances in properties, production and manufacturing techniques of the advanced polymer/fibre composite materials that are utilised in the manufacture of machines that produce sustainable energy. discussed the various methods of transferring wind, tidal, wave and solar energies into electrical power and this chapter will show how advanced composites are utilised in these various machines. Furthermore, it will suggest methods for the repair, maintenance and recycling of advanced polymer composite wind turbine blades. Finally, the future trends of sustainable energy systems and the role that polymers and polymer/fibre composites will have in their manufacture/-fabrication will be evaluated.

Fibre-reinforced polymer (FRP) composites have become essential materials for maintaining and strengthening existing infrastructure. Many new innovative types of hybrid material and structural systems have been developed using FRP composite materials. Increased utilisation of FRP requires that structural engineers and practitioners be able to understand the behaviour of FRP materials and design composite structures. This book provides an overview of different advanced FRP composites and the use of these materials in a variety of application areas. This chapter specifically covers a brief review on FRP applications and gives an outline of the book.

Fiber-reinforced polymer (FRP) composites have become an integral part of the construction industry because of their versatility, enhanced durability and resistance to fatigue and corrosion, high strength-to-weight ratio, accelerated construction, and lower maintenance and life-cycle costs. Advanced FRP composite materials are also emerging for a wide range of civil infrastructure applications. These include everything from bridge decks, bridge strengthening and repairs, and seismic retrofit to marine waterfront structures and sustainable, energy-efficient housing. The International Handbook of FRP Composites in Civil Engineering brings together a wealth of information on advances in materials, techniques, practices, nondestructive testing, and structural health monitoring of FRP composites, specifically for civil infrastructure. With a focus on professional applications, the handbook supplies design guidelines and standards of practice from around the world. It also includes helpful design formulas, tables, and charts to provide immediate answers to common questions. Organized into seven parts, the handbook covers: FRP fundamentals, including history, codes and standards, manufacturing, materials, mechanics, and life-cycle costs Bridge deck applications and the critical topic of connection design for FRP structural members External reinforcement for rehabilitation, including the strengthening of reinforced concrete, masonry, wood, and metallic structures FRP composites for the reinforcement of concrete structures, including material characteristics, design procedures, and quality assurance–quality control (QA/QC) issues Hybrid FRP composite systems, with an emphasis on design, construction, QA/QC, and repair Quality control, quality assurance, and evaluation using nondestructive testing, and in-service monitoring using structural health monitoring of FRP composites, including smart composites that can actively sense and respond to the environment and internal states FRP-related books, journals, conference proceedings, organizations, and research sources Comprehensive yet concise, this is an invaluable reference for practicing engineers and construction professionals, as well as researchers and students. It offers ready-to-use information on how FRP composites can be more effectively utilized in new construction, repair and reconstruction, and architectural engineering.

Advanced composite materials for bridge structures are recognized as a promising alternative to conventional construction materials such as steel. After an introductory overview and an assessment of the characteristics of bonds between composites and quasi-brittle structures, Advanced Composites in Bridge Construction and Repair reviews the use of advanced composites in the design and construction of bridges, including damage identification and the use of large rupture strain fiber-reinforced polymer (FRP) composites. The second part of the book presents key applications of FRP composites in bridge construction and repair, including the use of all-composite superstructures for accelerated bridge construction, engineered cementitious composites for bridge decks, carbon fiber-reinforced polymer composites for cable-stayed bridges and for repair of deteriorated bridge substructures, and finally the use of FRP composites in the sustainable replacement of ageing bridge superstructures. Advanced Composites in Bridge Construction and Repair is a technical guide for engineering professionals requiring an understanding of the use of composite materials in bridge construction. Reviews key applications of fiber-reinforced polymer (FRP) composites in bridge construction and repair Summarizes key recent research in the suitability of advanced composite materials for bridge structures as an alternative to conventional construction materials

Fibre-reinforced polymer (FRP) composites are increasingly being used in the field of civil engineering, either for the rehabilitation/retrofitting of existing infrastructures or for the construction of new structural elements. However, such applications are still recent and there are still unresolved questions regarding the long-term durability of FRP reinforcements or structural elements under service conditions, and their behaviour under accidental fire events as well. In this chapter, it is proposed to highlight the basic mechanisms involved in the environmental degradation of FRP composites, with a large emphasis on ageing mechanisms of the polymer matrix and their consequences on the mechanical properties. The last section is specifically devoted to the fire behaviour of polymer composites and also recalls existing fireproofing solutions.

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

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.

An overview is presented of four groups of static load tests to determine the mechanical properties of pultruded GFRP materials and structures. The first group includes standard and non-standard tests on material samples. The second group encompasses bending, buckling and collapse load tests on structural elements. The third and fourth groups include tests on bolted joints and sub-structures/full-scale structures, respectively. Throughout the overview, the difficulties of simulating practical support and loading conditions and monitoring deformations are emphasised. Future developments are mentioned briefly in the final section. It is noted that dynamic load testing and monitoring of static/dynamic deformations by means of full-field and other novel techniques are likely to receive much greater attention.

Given the increasing use of fibre-reinforced polymer (FRP) composites in structural civil engineering, there is a vital need for critical information related to the overall durability and performance of these new materials under harsh and changing conditions. Durability of composites for civil and structural applications provides a thorough overview of key aspects of the durability of FRP composites for designers and practising engineers. Part one discusses general aspects of composite durability. Chapters examine mechanisms of degradation such as moisture, aqueous solutions, UV radiation, temperature, fatigue and wear. Part two then discusses ways of using FRP composites, including strengthening and rehabilitating existing structures with FRP composites, and monitoring techniques such as structural health monitoring. Durability of composites for civil and structural applications provides practising engineers, decision makers and students with a useful and fundamental guide to the use of FRP composites within civil and structural engineering. Provides a thorough overview of key aspects of the durability of composites Examines mechanisms of degradation such as aqueous solutions, moisture, fatigue and wear Discusses ways of using FRP composites, including strengthening and rehabilitating existing structures

Despite considerable potential and many advantages over conventional materials, composites are making limited progress in the field of infrastructure applications, where the only niche market for composites is in FRP deck construction over steel girders and externally bonded FRP repair. The reasons, of course, are to be found in their high initial cost compared with conventional materials. This can only be addressed through the use of large-volume automated processes such as pultrusion and filament winding, which have the potential to lower the cost of raw materials and technologies for all applications. This chapter summarises the current level of applications of filament winding in the infrastructure industry.

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 onsite 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.

Thermosets such as phenolic thermosets are brittle at room temperature. Thus, in applications where good mechanical properties are required thermosets must be combined with reinforcements to improve these properties. Composites based on thermoset matrices can substitute for steel and concrete in some applications of civil construction structures because of their higher resistance to oxidation than steel and better freeze–thaw resistance than concrete. Furthermore, phenolic composites can be produced with complex shapes, and with careful design, materials can be obtained with high strength and stiffness and excellent impact strength, making these materials alternatives to metals. Construction materials require fire- and high-temperature-resistant components, and moldings and laminates based on phenolics can be utilized due to their resistance to burning and minimal smoke and toxic fumes production. Phenolic composites can positively impact the building and construction industry by improving safety and reducing cost.

This chapter provides some basic knowledge about FRP manufacturing processes involving prepreg materials. It contains information regarding the manufacture of prepreg semi-finished products, processing methods for obtaining structural components, and some considerations about quality. It is intended as an overview only, addressing engineering students or practitioners who have only little knowledge about composites and prepreg processing technologies.