

1. Record Nr.	UNINA9911007290703321
Autore	Low It-Meng
Titolo	Composite Materials : Manufacturing, Properties and Applications
Pubbl/distr/stampa	Elsevier San Diego : , : Elsevier, , 2021 ©2021
ISBN	9780128205129 0128205121
Descrizione fisica	1 online resource (690 pages)
Altri autori (Persone)	DongYu
Disciplina	620.118
Soggetti	Composite materials
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Intro -- Composite Materials: Manufacturing, Properties and Applications -- Copyright -- Contents -- Contributors -- Preface -- Section I: Manufacturing -- Chapter 1: Futuristic synthesis strategies for aluminum-based metal-matrix composites -- 1.1. Introduction -- 1.2. Classifications of composite materials -- 1.3. Description of the process and working principle -- 1.3.1. Microwave-assisted processes -- 1.3.1.1. Microwave hybrid sintering process -- 1.3.1.2. Microwave casting -- 1.3.1.3. Microwave hot pressing -- 1.3.2. Spark plasma sintering process -- 1.3.3. Friction stir processing -- 1.3.4. Disintegrated melt deposition -- 1.3.5. Ultrasonic-assisted casting -- 1.4. Mechanical properties and industrial scalability of Al-MMCs -- 1.5. Futuristic development and applications -- 1.6. Summary and future prospects -- References -- Chapter 2: Geopolymer composites modified with nanomaterials -- 2.1. Introduction -- 2.2. Nano-silica (NS) -- 2.2.1. Physical properties -- 2.2.2. Chemical properties -- 2.2.3. Effect of nano-silica on the properties of geopolymer composites -- 2.2.3.1. Workability -- 2.2.3.2. Geopolymerization -- 2.2.3.3. Setting time -- 2.2.3.4. Strength properties -- 2.2.3.5. Durability properties -- 2.2.3.6. Conclusions -- 2.3. Nano-clay -- 2.3.1. Physical properties -- 2.3.2. Chemical properties -- 2.3.3. Effect of nanoclay on the properties of geopolymer composites -- 2.3.3.1. Workability --

2.3.3.2. Geopolymerization -- 2.3.3.3. Setting time -- 2.3.3.4. Strength properties -- 2.3.3.5. Durability properties -- 2.3.3.6. Conclusions -- 2.4. Nano-alumina -- 2.4.1. Physical properties -- 2.4.2. Chemical properties -- 2.4.3. Effect of nano-alumina on the properties of geopolymer composites -- 2.4.3.1. Workability -- 2.4.3.2. Geopolymerization -- 2.4.3.3. Setting time -- 2.4.3.4. Strength properties -- 2.4.3.5. Durability properties. 2.4.3.6. Conclusions -- 2.5. Carbon nanotubes -- 2.5.1. Properties of CNTs -- 2.5.2. Effect of carbon nanotubes on the properties of geopolymer composites -- 2.5.2.1. Workability and setting times -- 2.5.2.2. Geopolymerization -- 2.5.2.3. Strength properties -- 2.5.2.4. Durability properties -- 2.5.2.5. Conclusions -- 2.6. Nano-titanium dioxide (Nano-TiO₂) -- 2.6.1. Properties of nano-TiO₂ -- 2.6.2. Effect of nano-TiO₂ on the properties of geopolymer composites -- 2.6.2.1. Workability -- 2.6.2.2. Geopolymerization -- 2.6.2.3. Setting time -- 2.6.2.4. Strength properties -- 2.6.2.5. Durability properties -- 2.6.2.6. Conclusions -- References -- Chapter 3: Advanced hybrid fiber-reinforced composites for high material performance -- 3.1. Introduction -- 3.2. Hybridization of carbon fiber and carbon nanotubes -- 3.2.1. Electrospray deposition method (ESD) -- 3.3. Performance of CF-CNT hybrid -- 3.3.1. Mechanical properties -- 3.4. Performance of CF-CNT hybrid fiber-reinforced polymer composites -- 3.4.1. Mechanical properties -- 3.4.2. Electrical properties -- 3.4.3. Thermal properties -- 3.5. Conclusion and future work -- References -- Chapter 4: 3D printing composite materials: A comprehensive review -- 4.1. Introduction -- 4.1.1. Basic concept of 3D printing -- 4.1.2. General stages in 3D printing -- 4.1.2.1. Creating 3-D models -- 4.1.2.2. File conversion of 3-D model -- 4.1.2.3. Optimization -- 4.1.2.4. 3-D printer setup -- 4.1.2.5. Build process -- 4.1.2.6. Removal and cleanup -- 4.1.2.7. Postprocessing -- 4.2. 3D printing techniques -- 4.2.1. Binder jetting (BJ) -- 4.2.2. Directed energy deposition (DED) -- 4.2.3. Material extrusion (ME)-Fused deposition modeling (FDM) -- 4.2.4. Material jetting (MJ) -- 4.2.5. Powder bed fusion (PBF) -- 4.2.6. Sheet lamination (SL) -- 4.2.7. Vat photopolymerization (VP) -- 4.3. 3D printing composite materials. 4.3.1. 3D printing of polymer matrix composites (PMCs) -- 4.3.1.1. 3D printing of PMCs with particle reinforcements -- 4.3.1.2. 3D printing of PMCs with fiber reinforcements -- 4.3.1.3. 3-D printing of PMCs with nanoparticle reinforcements -- 4.3.2. 3D printing of ceramic-matrix composites (CMCs) -- 4.3.2.1. 3D printing of CMCs with fiber reinforcements -- 4.3.2.2. 3D printing of CMCs with nanoparticle reinforcements -- 4.3.3. 3D printing of metal matrix composites (MMCs) -- 4.4. Applications -- 4.4.1. Biomedical applications -- 4.4.2. Aerospace applications -- 4.4.3. Automotive applications -- 4.4.4. Electronics applications -- 4.4.5. Food applications -- 4.4.6. Sport equipment -- 4.4.7. Marine applications -- 4.5. Summary and future perspectives -- References -- Chapter 5: Fiber composites of inorganic polymers (geopolymers) reinforced with natural fibers -- 5.1. Introduction -- 5.2. Aluminosilicate geopolymers -- 5.2.1. Formation mechanism and structure of the geopolymer matrix -- 5.2.2. Geopolymer synthesis parameters -- 5.3. Geopolymers reinforced with natural fibers -- 5.3.1. Cellulose-based fibers -- 5.3.1.1. Chemical structure and mechanical properties of cellulose-based fibers -- 5.3.1.2. Behavior in highly alkaline conditions -- 5.3.1.3. Flax fibers -- 5.3.1.4. Cotton fibers -- 5.3.1.5. Bamboo fibers -- 5.3.1.6. Other cellulose-based fibers -- 5.3.2. Protein-based fibers -- 5.3.2.1. Chemistry and structure of wool fibers -- 5.3.2.2. Mechanical properties of wool-reinforced geopolymers -- 5.3.2.3. Chemical

interactions between wool fiber and geopolymer matrix -- 5.3.2.4. Applications of wool-reinforced geopolymers -- 5.4. Concluding remarks -- References -- Section II: Properties -- Chapter 6: Interphase and interfacial properties of composite materials -- 6.1. Introduction -- 6.2. Fundamental concepts of composites -- 6.2.1. Reinforcements. 6.2.2. Matrix -- 6.2.2.1. Polymer matrix -- 6.2.2.2. Metal matrix -- 6.2.2.3. Ceramic matrix -- 6.2.3. Interphase -- 6.2.3.1. Interphase mechanism -- 6.2.3.2. Failure modes of the interphase -- 6.3. Interfacial properties -- 6.3.1. Interfacial shear strength -- 6.3.1.1. Interfacial shear strength of polymer matrix composites -- 6.3.1.2. Interfacial shear strength of metal and ceramic matrix composites -- 6.3.2. Fracture toughness -- 6.3.3. Improvement methods for interfacial properties -- 6.3.3.1. Reinforcement treatment -- 6.3.3.2. Matrix modifications -- 6.4. Future perspectives -- 6.5. Conclusions -- References -- Chapter 7: Durability and life prediction of fiber-reinforced polymer composites -- 7.1. Introduction -- 7.2. Durability of FRP composites -- 7.2.1. Single environmental effects on FRP composites based on epoxy, polyester and vinylester -- 7.2.1.1. Elevated temperature -- 7.2.1.2. Low temperature and freeze-thaw cycling -- 7.2.1.3. Moisture -- 7.2.1.4. Acidity and alkalinity -- 7.2.1.5. UV radiation -- 7.2.2. Effects of environmental and sustained mechanical load -- 7.3. Life prediction of FRP composites -- 7.3.1. Motivations of characterization for FRP composite life -- 7.3.2. Life-prediction models based on accelerated tests -- 7.3.2.1. Time-temperature-superposition principle -- Single horizontal shift in time domain -- Vertical and horizontal shifts -- Applications of TTSP-empirical Arrhenius plots -- 7.3.3. Other life-prediction methods -- 7.3.3.1. Artificial intelligence techniques -- Theoretical methods based on physical-chemical evolutions -- 7.4. Summary -- References -- Chapter 8: Composites for structural strengthening, repair, rehabilitation, and retrofit -- 8.1. Introduction -- 8.2. Composite materials -- 8.2.1. Fiber-reinforced polymers (FRPs) -- 8.2.1.1. Definition, history, and potentials. 8.2.1.2. Materials and properties -- 8.2.1.3. Material modifications and surface preparation -- 8.2.1.4. Manufacturing and installation methods -- 8.2.1.5. Applications -- 8.2.2. Engineered cementitious composites (ECCs) -- 8.2.2.1. Definition, history, and potentials -- 8.2.2.2. Materials and properties -- 8.2.2.3. Manufacturing and installation methods -- 8.2.2.4. Applications -- 8.3. Further consideration aspects for using composite as strengthening materials -- 8.3.1. Durability -- 8.3.2. Fire resistance -- 8.3.3. Numerical modeling -- 8.4. Conclusions and outlook -- References -- Chapter 9: Vinyl-ester composites reinforced with natural fibers and nanofillers -- 9.1. Introduction -- 9.2. Experimental procedure -- 9.2.1. Materials -- 9.2.2. Preparation of samples -- 9.2.2.1. Cellulose fiber-reinforced polymer composites -- 9.2.2.2. Polymer nanocomposites -- 9.2.2.3. Polymer composites reinforced with cellulose fibers and nanoclay platelets or halloysite nanotubes -- 9.2.3. Characterization of physical and mechanical properties -- 9.2.3.1. Porosity -- 9.2.3.2. Flexural strength -- 9.2.3.3. Impact toughness -- 9.2.3.4. Fracture toughness -- 9.2.3.5. Thermal stability and flammability -- 9.3. Results and discussion -- 9.3.1. Porosity -- 9.3.2. Flexural strength -- 9.3.3. Impact toughness -- 9.3.4. Role of water absorption on durability -- 9.3.5. Fracture toughness -- 9.3.6. Thermal stability and flammability -- 9.4. Conclusions -- Acknowledgments -- References -- Chapter 10: Fracture mechanics of composites: Reinforcement of short carbon and glass fibers -- 10.1. Introduction -- 10.2. Experiment procedure --

10.2.1. Materials and specimens -- 10.2.2. Equipment for impact testing -- 10.3. Results and discussion -- 10.3.1. Equation of energy release rate -- 10.4. Conclusions -- References.

Chapter 11: Mechanical properties of recycled polyethylene terephthalate (PET) fiber-reinforced fly ash geopolymer and f.

Sommario/riassunto

Composite materials have been well developed to meet the challenges of high-performing material properties targeting engineering and structural applications. The ability of composite materials to absorb stresses and dissipate strain energy is vastly superior to that of other materials such as polymers and ceramics, and thus they offer engineers many mechanical, thermal, chemical and damage-tolerance advantages with limited drawbacks such as brittleness. Composite Materials: Manufacturing, Properties and Applications presents a comprehensive review of current status and future directions, latest technologies and innovative work, challenges and opportunities for composite materials.
