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| Nota di contenuto | Intro -- Contents -- Preface -- About the Editors -- Dr. Debasis Chaira -- Evolution of Powder Metallurgy -- Press-and-Sinter Powder Metallurgy Gains Acceptance -- Powder Injection Molding Processes Offer Complex-Shaped Parts -- Metal Additive Manufacturing Provides Freedom of Design -- Examples of Powder Metallurgy Applications -- Powder Production Methods -- Mechanical Fabrication Techniques -- Machining -- Milling and Mechanical Alloying -- Electrolytic Fabrication Technique -- Chemical Methods of Fabrication of Powder -- Reduction of Metal Oxide by Reducing Gas -- Thermal Decomposition of Metal Carbonyls -- Hydrometallurgical Method -- Solid-State Reactive Synthesis -- Atomization Techniques -- Gas Atomization -- Water Atomization Technique -- Centrifugal Atomization Technique -- Summary -- Powder Characterization Methods -- Characterization of Powder -- Investigation by X-Ray Diffraction -- Analysis by Differential Scanning Calorimetry -- Microstructure Study -- Study of Nanopowder Stability -- Flowability Study -- Surface Area Study -- Summary -- Fabrication of Bulk Components from Mechanically Alloyed Powders -- Nanopowder Densification -- Mechanical Milling/Alloying of Powder Materials -- Process Variables of Mechanical Milling and Their Effects |

-- Sintering Mechanisms -- Consolidation of Mechanically Milled or Alloyed Powder Materials -- Conventional Methods Based on Pressureless Sintering -- Laser-Assisted Sintering -- Pressure-Assisted Consolidation Methods -- Hot Pressing -- Hot Isostatic Pressing -- High-Pressure Torsion -- Microwave Sintering -- Spark Plasma Sintering -- Pulse Plasma Sintering -- Summary -- Various Conventional and Advanced Sintering Methods to Consolidate Powders -- Sintering Techniques -- Conventional Sintering -- Advantages of Conventional Sintering -- Disadvantages of Conventional Sintering. Advanced Sintering Techniques -- Microwave Sintering -- Advantages of Microwave Sintering -- Disadvantages of Microwave Sintering -- Pressure-Assisted Sintering Techniques -- Plastic Flow -- Creep Flow -- Viscous Flow -- Hot Pressing -- Advantages of Hot Pressing -- Disadvantages of Uniaxial Hot Pressing -- Hot Isostatic Pressing -- Advantages of Hot Isostatic Pressing -- Disadvantages of Hot Isostatic Pressing -- Spark Plasma Sintering -- Advantages of Spark Plasma Sintering -- Disadvantages of Spark Plasma Sintering -- Laser Sintering -- Machine-Based Process Parameters -- Laser-Based Process Parameters -- Advantages of Laser Sintering -- Disadvantages of Laser Sintering -- Effect of Consolidation Techniques on Selected Materials Systems -- Tungsten Heavy Alloys -- Ti-6Al-4V Alloy -- Steel -- Nd-Fe-B/Sm-Co Magnetic Materials -- Summary -- Sintering Concepts Relevant to Greater Density and Improved Properties -- Basics -- Atomic Motion -- Control Parameters -- Microstructure Trajectory -- Effects of Key Parameters -- Prealloyed 17-4 PH Powders -- Sintered Density versus Temperature -- Graphite Vacuum Furnaces -- Dimensional Uniformity -- Summary -- Comparing the Microstructure of Components Prepared by Various Powder Metallurgy and Casting Methods -- Casting -- Microstructures of Casted Materials -- Powder Metallurgy -- Summary -- Relationship of Structure-Properties on the Powder Metal Materials -- Outline placeholder -- Advantages of Powder Metallurgy -- Disadvantages of Powder Metallurgy -- Uses of Powder Metallurgy -- Coatability of Powder Metal Parts -- Galvanized Coating -- Amount of Coating -- Joinability of Powder Metal Parts -- Sinter Bonding -- Microstructures -- Element Diffusion during Sinter Bonding -- Resistance Spot Welding of Powder Metal Parts -- Joinability of Brass Alloys by Furnace and Microwave Brazing. Weldability of Powder Metal Parts by Fusion Welding Technique -- Weld Metal and Transition Zone -- Effect of Porosity on Thermal Conductivity of Powder Metal Materials -- Wear Properties of Powder Metal Materials -- How Does Powder Metallurgy Facilitate the Preparation of Intermetallics and High-Entropy Alloys? -- Powder Metallurgy of Intermetallics -- Mechanical Alloying -- Field-Assisted Sintering Techniques -- Shock Consolidation -- Powder Metallurgy of High-Entropy Alloys -- Summary -- Additive Manufacturing-History, Recent Developments, and Advancement -- Vat Photopolymerization -- Material Extrusion -- Material Jetting -- Binder Jetting -- Sheet Lamination -- Directed-Energy Deposition -- Powder-Bed Fusion -- Selective Laser Sintering -- Selective Laser Melting -- Electron Beam Melting -- High-Speed Sintering -- 3D and 4D Printing -- 3D Printing -- 4D Printing -- Conclusion -- Comparison of Additive Manufacturing and Powder Metallurgy Methods and Their Components -- Process Details -- Classification -- Powder-Bed Fusion -- Directed-Energy Deposition -- Solid-State Additive Manufacturing -- Ultrasonic Additive Manufacturing -- Binder Jetting -- Friction Additive Manufacturing -- Additive Friction Stir Deposition or Friction Surface Additive Manufacturing -- Conventional (Press-and-Sinter) Powder Metallurgy Route -- Full-Density Powder Metallurgy Route -- Powder Forging --

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Nanomaterials-Based Additive Manufacturing for the Production of 3D-Printed Batteries and Supercapacitors -- Advancements in Additive Manufacturing for Energy Storage Devices -- Innovative Fabrication Techniques and Materials for Next-Generation Batteries and Supercapacitors -- Printing Systems -- Case Study -- Methods of Testing and Characterization -- Galvanostatics Charge/Discharge Test -- Conclusion -- Additive Manufacturing in the Automotive, Medical, and Construction Industries -- Methods of Additive Manufacturing -- Fused Deposition Modeling -- Stereolithography -- Selective Laser Sintering -- Inkjet Printing -- Electron Beam Melting -- Recent Trends in the Market -- Metal 3D Printing -- Global Impact -- Research and Development -- Additive Manufacturing in the Automotive Sector -- Additive Manufacturing in the Medical Sector -- Medical Models -- Implants -- Tools, Instruments, and Parts for Medical Devices -- Medical Aids, Supportive Guides, Splints, and Prostheses -- Biomanufacturing -- Additive Manufacturing in the Construction Industry -- Multiple Materials -- In Situ Resources -- Hybrid Techniques -- Off-Site/On-Site Fabrication -- The Future of Additive Manufacturing -- Conclusion -- Role of Powder Metallurgy Industries in Various SectorsPart 1 -- History of Powder Metallurgy -- Advantages and Disadvantages of Powder Metallurgy -- Advantages of Powder Metallurgy -- Disadvantages of Powder Metallurgy -- The Process of Powder Metallurgy -- Preparation of Metal Powder -- Blending or Mixing -- Compaction or Briquetting -- Sintering -- Hot Pressing -- Secondary Operations -- Sizing -- Coining -- Infiltration -- Impregnation -- Heat Treatment -- Applications of Powder Metallurgy -- Automotive Industry -- Civilian Nuclear Industry -- Wind Power Industry -- Biomedical Industry -- Flying Car Industry -- Aerospace Industry -- Conclusions.

Role of Powder Metallurgy Industries in Various SectorsPart 2 -- Overview of Powder Metallurgy -- Industry 4.0 -- Types of Materials Used in the Powder Metallurgy Process -- Industries That Use Powder Metallurgy -- Powder Metallurgy Manufacturing Methods in the Automotive Industry -- Metal Injection Molding -- Additive Manufacturing -- Metal Foaming -- Powder Forging -- Hot Isostatic Pressing -- Electric-Current-Assisted Sintering Technologies -- Development and Applications of Powder Metallurgy in the Automotive Industry -- Permanent Magnets -- Hyperloop -- Noise Mitigation -- Conclusion -- The Economic Contribution of Powder Metallurgy Industries, Associations, and Employment Opportunities -- Economic Importance and Industrial Applications of Various Powder Metallurgy Industries -- Traditional Powder Metallurgy Process -- Powder Injection Molding and Metal Injection Molding Processes -- Hot Isostatic Pressing Process -- Additive Manufacturing Process -- Scope and Opportunities of Various Powder Metallurgy Associations and Companies -- Asian Region -- North America Region -- European Region -- European Powder Metallurgy Association's Seminars and Programs -- European Powder Metallurgy Association Publications -- Employment Opportunities and Organizations in the Powder Metallurgy Industry -- Conclusions -- Chap -- Index.

This book gives in-depth information about the evolution of powder metallurgy. Detailed explanations of powder production techniques are included, and advanced techniques such as additive manufacturing are explained. A comparison of additive manufacturing and powder metallurgy methods is included. Topics include conventional and advanced methods used to prepare powders, characterization methods to investigate powders, powder compaction and sintering methods, consolidation, density, microstructure of components, and the role of nanomaterials in additive manufacturing to produce energy storage devices. Applications of additive manufacturing in the construction, automobile, and medical industries are explored. A comparison of additive manufacturing and powder metallurgy is included. The economic impact of PM technology and general job opportunities in the PM industry are also included. Experts and well-known specialists in the distinct fields of powder metallurgy and additive manufacturing authored the individual chapters.
