Volume 7 Powder Metal Technologies and Applications

1. Introduction

History of Powder Metallurgy Powder Metallurgy Methods and Design Advances in Powder Metallurgy Applications Powder Metallurgy Process Modeling and Design

2. Metal Powder Production and Characterization

Introduction to Metal Powder Production and Characterization Atomization Milling of Brittle and Ductile Materials Chemical and Electrolytic Methods of Powder Production Ultrafine and Nanophase Powders Mechanical Alloying Spray Drying and Granulation **Rotating Electrode Process** Blending and Premixing of Metal Powders and Binders Effect of Blending Techniques on Properties of Metal Powder Mixes Production of Iron Powder Production of Steel Powders **Production of Copper Powders** Production of Copper Alloy Powders Production of Tin Powders Production of Aluminum and Aluminum-Alloy Powder Production of Titanium Powder Production of Nickel-Base Powders Production of Cobalt-Base Powders Production of Precious Metal Powders: Silver, Gold, Palladium, and Platinum Production of Refractory Metal Powders Production of Beryllium Powders Sampling and Classification of Powders Bulk and Surface Characterization of Powders Particle Size and Size Distribution in Metal Powders Sieve and Fisher Subsieve Analysis of Metal Powders Sedimentation Methods for Classifying Metal Powders Electric and Optical Sensing Zone Analysis of Powders Light Scattering Measurement of Metal Powders Time of Flight Measurement of Metal Powders Particle Image Analysis

Surface Area, Density, and Porosity of Powders Bulk Properties of Powders Compressibility and Compactibility of Metal Powders

3. Shaping and Consolidation Technologies

Powder Shaping and Consolidation Technologies Powder Treatments and Lubrication Mechanical Behavior of Metal Powders and Powder Compaction Modeling Powder Metallurgy Presses and Tooling Powder Injection Molding **Binder-Assisted Extrusion** Warm Compaction **Cold Isostatic Pressing Roll Compacting of Metal Powders** Spray Forming Thermal Spray Forming of Materials Slip Casting of Metals Powder Metallurgy Methods for Rapid Prototyping **Consolidation Principles and Process Modeling** Sintering Furnaces and Atmospheres **Production Sintering Practices** Consolidation of Ultrafine and Nanocrystalline Powder **Reactive Sintering** Combustion Synthesis of Advanced Materials Infiltration Liquid-Phase Sintering Cold Sintering--High Pressure Consolidation **Field-Activated Sintering** Principles and Process Modeling of Higher-Density Consolidation Hot Isostatic Pressing of Metal Powders **Extrusion of Metal Powders** Forging and Hot Pressing **Pneumatic Isostatic Forging**

4. Secondary Operations and Quality Control

Heat Treatment of Ferrous Powder Metallurgy Parts Welding and Joining Processes Techniques for Improving Dimensional Tolerance of Powder Metallurgy Machinability of P/M Steels Machining of Powder Metallurgy Materials Resin Impregnation of Powder Metal Parts Planning and Quality Control of Powder Metallurgy Parts Production Quality Control and Inspection of Powder Metallurgy Secondary Operations Testing and Evaluation of Powder Metallurgy Parts Metallography of Powder Metallurgy Materials

5. Materials Systems, Properties, and Applications

Ferrous Powder Metallurgy Materials **Copper-Infiltrated Steels** Powder Metallurgy Stainless Steels Particle Metallurgy Tool Steels Powder Forged Steel High-Temperature Sintering of Ferrous Powder Metallurgy Components **Conventional Aluminum Powder Metallurgy Alloys** Advanced Aluminum Powder Metallurgy Alloys and Composites Copper Powder Metallurgy Alloys and Composites Titanium Powder Metallurgy Alloys and Composites Powder Metallurgy Superalloys Powder Metallurgy Refractory Metals Powder Metallurgy Tungsten Heavy Alloys Powder Metallurgy Cermets and Cemented Carbides Powder Metallurgy Beryllium Mechanical Properties of High-Performance Powder Metallurgy Parts Fatigue and Fracture Control for Powder Metallurgy Components Wear Resistance of Powder Metallurgy Alloys Corrosion-Resistant Powder Metallurgy Alloys Magnetic Materials and Properties for Powder Metallurgy Part Applications Powder Metallurgy Electrical Contact Materials Porous Powder Metallurgy Technology **Metallic Foams** Friction Powder Metallurgy Materials **Powder Metallurgy Bearings** Powder Metallurgy Gears Metal and Alloy Powders for Welding, Hardfacing, Brazing, and Soldering Specialty Applications of Metal Powders

6. Appendices

Appendix 1: Mechanical Properties of Ferrous Powder Materials Appendix 2: Powder Metallurgy Standards Appendix 3: Examples of Powder Metallurgy Parts