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2.3.2 Surface Modification of Fe₃O₄ Nanoparticles; 2.3.3 Surface Modification of Silica Nanoparticles; 2.4 Preparation and Characterization of Polymer-Inorganic Nanocomposites; 2.4.1 Nanopolymer Matrix Composites; 2.5 Preparation of Polymer-Inorganic Nanocomposites; 2.5.1 Sol-Gel Processing; 2.5.2 In Situ Polymerization; 2.5.3 Particle In Situ Formation; 2.5.4 Blending; 2.5.4.1 Solution Blending; 2.5.4.2 Emulsion or Suspension Blending; 2.5.4.3 Melt Blending; 2.5.4.4 Mechanical Grinding/Blending; 2.5.5 Others; 2.6 Characterization of Polymer-Inorganic Nanocomposites; 2.6.1 X-Ray Diffraction; 2.6.2 Infrared Spectroscopy; 2.6.3 Mechanical Property Test; 2.6.4 Abrasion Resistance Test; 2.6.5 Impact Strength; 2.6.6 Flexural Test; 2.6.7 Others; 2.7 Applications of Polymer-Inorganic Nanocomposites; 2.7.1 Applications of Bi-YIG Films and Bi-YIG Nanoparticle-Doped PMMA; 2.7.1.1 Magneto-Optical Isolator; 2.7.1.2 Magneto-Optical Sensor; 2.7.1.3 Tuned Filter; 2.7.1.4 Magneto-Optical Recorder; 2.7.1.5 Magneto-Optic Modulator; 2.7.1.6 Magneto-Optic Switch; 2.8 Application of Magnetic Fe₃O₄-Based Nanocomposites; 2.9 Applications of ZnO-Based Nanocomposites; 2.9.1 Gas Sensing Materials; 2.9.2 Photocatalyst for Degradation of Organic Dye; 2.9.3 Benard Convection Resin Lacquer Coating; 2.10 Applications of Magnetic Fluid; References; 3 Theory and Simulation in Nanocomposites; 3.1 Introduction; 3.1.1 Dispersion of Nanoparticles; 3.1.2 Interface; 3.1.3 Crystallization; 3.1.4 Property Prediction; 3.2 Analytical and Numerical Techniques; 3.2.1 Analytical Models; 3.2.2 Numerical Methods; 3.2.3 Multiscale Modeling; 3.3 Formation of Nanocomposites; 3.3.1 Thermodynamics of Nanocomposite Formation; 3.3.2 Kinetics of Nanocomposite Formation; 3.3.3 Morphology of Polymer Nanocomposites; 3.4 Mechanical Properties

Sommario/riassunto

Polymer composites are materials in which the matrix polymer is reinforced with organic/inorganic fillers of a definite size and shape, leading to enhanced performance of the resultant composite. These materials find a wide number of applications in such diverse fields as geotextiles, building, electronics, medical, packaging, and automobiles. This first systematic reference on the topic emphasizes the characteristics and dimension of this reinforcement. The authors are leading researchers in the field from academia, government, industry, as well as private research
