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Concluding Remarks; References

3. Solution Combustion Synthesis of Oxide Materials3.1 Introduction; 3.2 Solution Combustion Synthesis (SCS); 3.2.1 Synthesis of Alumina; 3.2.2 Mechanism of Aluminum Nitrate - Urea Combustion Reaction; 3.2.3 Thermodynamic Calculation; 3.3 Role of Fuels; 3.4 A Recipe for the Synthesis of Various Classes of Oxides; 3.4.1 Recipe for Nanomaterials; 3.5 Salient Features of Solution Combustion Method; References; 4. Alumina and Related Oxide Materials; 4.1 Introduction; 4.2 Alumina and Related Oxide Materials; 4.3 -Alumina; 4.4 Metal Aluminates (MAl2O4); 4.5 Rare Earth Orthoaluminates (LnAlO3) 4.6 Garnets4.7 Aluminum Borate; 4.8 Tialite (-Al2TiO5); 4.9 Aluminum Phosphate; 4.10 Alumina Composites; 4.10.1 Al2O3 · SiO2 System: Mullite; 4.10.2 Al2O3 · SiO2 System: Cordierite; 4.10.3 Al2O3 · Si3N4 System: SiAlON; 4.11 Alumina Nanocomposites; 4.11.1 Nanocatalysts,Dispersion ofNano-metals (Ag, Au, Pd, and Pt) in Al2O3; 4.12 Nanopigments; 4.12.1 Cobalt-Based Blue Alumina and Aluminates; 4.12.2 Chromium-Doped Pink Alumina (Cr3+/Al2O3): Ruby; 4.12.3 Chromium-Doped Aluminates and Orthoaluminates (Cr3+/MAl2O4(M = Mg & Zn)) and LaAlO3); 4.13 Nanophosphors 4.13.1 Phosphor Materials (Luminescence in Aluminum Oxide Hosts) 4.14 Concluding Remarks; References; 5. Nano-Ceria and Metal-Ion-Substituted Ceria; 5.1 Introduction; 5.2 Synthesis and Properties of Nano-Ceria; 5.3 Synthesis of Metal-Ion-Substituted Ceria; 5.4 Characterization of Metal-Ion-Substituted Ceria; 5.5 Oxygen Storage Materials; 5.6 Metal-Ion-Substituted Ceria as Nanocatalysts; 5.6.1 Ce1. xPdxO2. as a Three-Way Catalyst; 5.6.2 Ce1-xPtxO2-; 5.6.3 Ce1. xRhxO2.; 5.6.4 Bimetal Ionic Catalysts (Ce1.xPtx/2Rhx/2O2.); 5.7 Concluding Remarks; References; 6. Nanocrystalline Fe2O3 and Ferrites 6.1 Magnetic Materials

Sommario/riassunto

Nano-oxide materials lend themselves to applications in a wide variety of emerging technological fields such as microelectronics, catalysts, ceramics, coatings, and energy storage. However, developing new routes for making nano-based materials is a challenging area for solid-state materials chemists. This book does just that by describing a novel method for preparing them. The authors have developed a novel low-temperature, self-propagating synthetic route to nano-oxides by the solution combustion and combustible precursor processes. This method provides the desired composition, structure, and