

Preface

Three-dimensionally ordered macroporous (3DOM) and nanostructured catalysts are more and more important for highly developed applications relating in photonic crystals, catalysis, and membrane separation. Recent theoretical and experimental studies have recommended that noble metals supported on perovskite-type oxides (ABO_3) with well-ordered porous networks show promising redox properties. 3DOM structure-supported noble metals have shown great potential for broad applications due to their interesting properties (e.g., high BET and ordered meso-structures). Although the macroporous metals (voids >50 nm) have been widely achieved, the fabrication of ordered macroporous perovskites with mesoporous skeletons is still challenging. This book contains 5 chapters. The introduction (Chap. 1) covers the development of natural gas vehicle, research progress of catalytic CH_4 combustion catalyst, and viewpoint of the synthesis for perovskite-mixed oxide (ABO_3). Chapter 2 summarizes the preparation of 1D single-crystalline nanowire of perovskite-type oxides $\text{La}_{0.5}\text{Sr}_{0.5}\text{CoO}_3$, which were prepared by a dextrose-assisted hydrothermal route (DHR) and/or L-Lysine. Study on 1 Dimensional single-crystalline LSCO nanowires and their characterization such as XRD, HRSEM, HRTEM, and BET, as well as activity evaluation of catalyst such as influence of preparation method, stability, calcinations, and space gas velocity on catalytic activity. Chapter 3 is devoted to the three-dimensionally ordered macroporous rhombohedral $\text{La}_{0.6}\text{Sr}_{0.4}\text{MnO}_3$ (3DOM LSMO) with nanovoids, which were synthesized using polymethyl methacrylate (PMMA) microspheres as hard template and dimethoxytetraethylene glycol (DMOTEG), ethylene glycol, polyethylene glycol (PEG400), L-lysine, or triblock copolymer (Pluronic P-123) as surfactant. In Chap. 4, we focus on the synthesis of the highly dispersed Ag NPs supported on high-surface-area 3DOM $\text{La}_{0.6}\text{Sr}_{0.4}\text{MnO}_3$ ($y\text{Ag}/3\text{DOM La}_{0.6}\text{Sr}_{0.4}\text{MnO}_3$; $y = 0, 1.57, 3.63, \text{ and } 5.71$ wt%) were successfully generated with high surface areas ($38.2\text{--}42.7$ m^2/g) via the dimethoxytetraethylene glycol-assisted gas bubbling reduction method. Meanwhile, the effects of H_2O and SO_2 on the catalytic activity of the 3.63 wt% $\text{Ag}/3\text{DOM La}_{0.6}\text{Sr}_{0.4}\text{MnO}_3$ sample were also examined. In the meantime, describe the most widely used experimental techniques on the structures characterization of 3DOM materials. It is concluded that its super

catalytic activity was associated with its highest oxygen adspecies concentration, good low-temperature reducibility, larger surface area, and strong interaction between metal and support as well as unique nanovoid-walled 3DOM structure. It is apparent that the 3DOM material field is eager for more and more researchers from other field to explore attractive applications.

This book condenses the authors' great efforts and contributions. We hope that this book can provide beneficial help and inspiration for undergraduate, graduate students, scientists, and researchers who are majoring in environment, chemical engineering, chemistry, and materials. Due to the relatively wide areas covered in this book, the numerous contents with connection to complex scientific issues, together with the limited knowledge and ability of the authors, we sincerely appreciate the criticism and comments from readers.

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Mixed Oxides

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