Nano MoO₃ Phase Structural Evolution During Hydrothermal Synthesis and Its Electrochemical Properties

Li Jiwen¹, Wei Shizhong^{1,2}, ZHANG Guo-shang¹, XU Liujie^{1,2}, Liu Wei¹, Pan Kunming²

¹ Material Science & Engineering School, Henan University of Science & Technology, Luoyang 471023, China

² Henan Engineering Research Center for Wear of Materials, Henan University of Science & Technology, Luoyang 471003, China

*E-mail: ljwtzq@haust.edu.cn

doi: 10.20964/2017.03.15

Received: 9 July 2016 / Accepted: 29 December 2016 / Published: 12 February 2017

Micron rods of hexagonal MoO₃ (h-MoO₃) and nanobelts of orthorhombic MoO₃ (α-MoO₃) were prepared using a facile hydrothermal synthesis. The factors that influenced the morphologies, crystalline structures and electrochemical properties of the MoO₃ were investigated by X-ray diffraction (XRD), scanning electron microscopy (SEM) and transmission electron microscopy (TEM). The experimental revealed that both the reaction time and acidity coefficient played important roles in controlling the crystalline structure and morphology of the MoO₃; however, the acidity coefficient was the crucial factor. At lower acidity coefficient, the growth of the MoO₃ nucleus only resulted in well-crystallized h-MoO₃ rods as the reaction time increased. As the acidity coefficient increased, the h-MoO₃ phase was transformed into an α-MoO₃ phase and the morphology changed gradually from three-dimensional hexagonal micron rods to low-dimension nanobelts. As the anode electrode, the α-MoO₃ nanobelts exhibited better electrochemical properties. The initial specific capacities of 223.1 mAh•g⁻¹ and a wide discharge plateau of 2.2V for the α-MoO₃ were obtained. On the other hand a stable electrochemical performance was achieved for h-MoO₃ micron rods.

Keywords: hydrothermal synthesis; h-MoO₃ micron rods; α-MoO₃ nanobelts; reaction time; acidity coefficient; electrochemical properties

[FULL TEXT](#)

© 2017 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).