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Synthesis and Li-storage property of flower-like SbPO₄ microspheres

Ming Ou^a, Yan Ling^a, Lin Ma^{a,*}, Zhiheng Liu^a, Dengqin Luo^a, Limei Xu^{a,†}

a. *School of Chemistry and Chemical Engineering, Lingnan Normal University, Zhanjiang 524048, P. R. China.*

Abstract

Hierarchical SbPO₄ flower-like microspheres (SbPO₄ FM) have been successfully prepared by a facile solvothermal method. The XRD, TEM, SEM and BET techniques were adopted to inspect the obtained SbPO₄ products. Experimental results indicated that the as-prepared SbPO₄ flower-like microspheres belonged to a monoclinic phase and were assembled by numerous nanoplates to form hierarchical porous architectures. A self-assembly mechanism accounted for the formation of the as-prepared SbPO₄ flower-like microspheres. Besides, the electrochemical Li-storage property was also investigated as an anode for lithium-ion battery.

Keywords: Nanocrystalline materials; Crystal growth; Energy storage and conversion; Microstructure.

1. Introduction

Over the past few decades, lithium-ion batteries (LIBs) have sprung up to be the potential contestants for energy storage and conversion owing to their high capacity, long cycle life, high energy density, and good safety [1]. The commercialized graphite is widely applied as an anode material for LIBs but is subjected to the low capacity and poor rate capability [2]. It is imperative to develop other alternative electrode materials for LIBs with larger capacity.

Recently, 2D materials such as transition metal phosphates [3, 4] become promising anodes for LIBs. Among them, SbPO₄ (antimony phosphate) is a layered phosphate applied in material research field related to catalysis, refractories and (doped) glasses [5]. Moreover, SbPO₄ can serve as an electrode for LIBs based on redox transitions between Sb³⁺ and Sb metal states as well as alloying reaction of Sb with lithium [6-10], which gives arise to a theoretical capacity of ~742 mAh g⁻¹. Till date, nanosized SbPO₄ materials with different morphologies including nanoparticles, nanorods and ribbons

* Corresponding author. Tel.: +86 759 3174025; Fax: +86 759 3183510.

E-mail address: mal@lingnan.edu.cn

† Corresponding author. Tel.: +86 759 3183205.

E-mail address: xulimei78@126.com

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