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# Synthesis and characterization of novel hierarchical metal oxide using scallion root as biotemplate

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**ABSTRACT:** The roots of plants have rarely been used as templates. In this work, four novel hierarchical metal oxides were firstly synthesized by a simple immersion and calcination method using scallion root as natural biotemplate. The as-synthesized metal oxides have principally inherited the tubular frame structure of scallion root with rib-shaped inside walls. The hierarchical tubular structure of  $\text{Co}_3\text{O}_4$ ,  $\text{Fe}_2\text{O}_3$  and NiO are assembled by small particles with diameter of 7~20 nm, while the morphology of the building blocks for ZnO micro-tubes changes from hexagonal nanoplates to hexagonal nanorods with the increasing concentration of the  $\text{Zn}^{2+}$  immersing solution. These results reveal that scallion root is a good biotemplate for the synthesis of novel hierarchical metal oxides.

**KEYWORDS:** scallion root, biotemplate, porous material, microstructure

## 1. Introduction

Natural biomaterials provide various elaborating architectures with multiple sizes ranging from nanoscale to macroscale [1]. Recently, biomorphic templating synthesis has attracted extensive attention for fabricating hierarchical nanomaterials and variety of sophisticated hierarchical architectures has been replicated by introducing the biological materials as templates [2]. Compared to tissues of animals and microbes, organs of plants as biotemplates were preferred owing to their wider sources and lower prices. Up to now, many metal oxides (MOs)

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