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Preparation and characterization of conductive antimony-doped tin oxide (ATO) nanoparticles*

LIN Feng(林 锋)[1], DUAN Xue-chen(段学臣)[2], REN Xian-jing(任先京)[1]

(1. Beijing General Research Institute of Mining and Metallurgy, Beijing 100044, China; 2. School of Materials Science and Engineering, Central South University, Changsha 410083, China)

Abstract: In this paper, conductive antimony-doped tin oxide (ATO) composite particles is prepared by hydroxylation method of metal alcoxides. This method has many advantages such as little pollution, low-cost, simple sheet and equipment. The synthesis processing and the ATO nanoparticles are characterized by means of transmission electron microscope (TEM), X-ray diffraction (XRD), thermal gravimetric and differential thermal analysis, and BET. The results show that the ATO nanoparticles is tetragonal rutile crystal structure. TEM show that the particles are monodispersed with weak aggromation. The size of the particles calcinated at 700 is about 8nm. The specific areas are 153 $m^2 \cdot g^{-1}$. In addition to, ATO nanoparticles have good electric properties

Key words: nanoparticle; tin oxide; conductive ATO; metal alcoxides; hydroxylation

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1 Introduction

Antimony-doped tin oxide (ATO) deposited on glass substrate are important materials in the field of optoelectronic devices such as solar cells, electrolumine scene and liquid crystal displays. Antimony-doped tin oxide is widely used as transparent electrodes in these applications[1-4].

In this paper, conductive antimony-doped tin oxide (ATO) composite particles are prepared by hydroxylation method of metal alcoxides. This method has many advantages including little pollution, low-cost, simple sheet and equipment.

2 Experimental

2.1 Synthesis

Conductive antimony doped tin oxide (ATO) composite particles are prepared by hydroxylation method of metal alcoxides, as shown in Fig. 1.

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Biography: LIN Feng(born in 1978), Male, Engineer, Master.

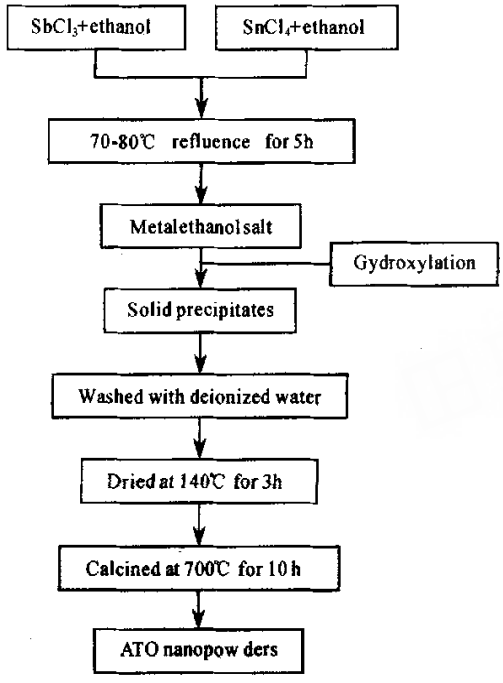

Fig. 1 Flow process of synthiess of ATO nanopowders

2.2 Characterization

The powders are characterised by high resolution transmission electron microscopy (HRTEM—CM200 FEG, Philips), and X-ray diffraction (XRD) (RIGAKU D/MAX 2000X, Japanese) is used to analysis the crystal structure of the particles. Their crystallite size is calculated by use of the result of X-ray diffraction and BET. The synthesis processing is characterized by means of thermal gravimetric and differential thermal analysis.

3 Results and discussion

3.1 Thermal gravimetric and differential thermal analysis

The synthesis processing is characterized by means of thermal gravimetric and differential thermal analysis. The TG-DTA of Solid precipitate is shown in Fig. 2.

3.2 TEM results and analysis

TEM photograph of the nanocrystalline ATO paticles is shown at Fig. 3. TEM shows that the particles are monodispersed with weak aggromation. The size of the particles calcinated at 700 is about 8 nm.

3.3 Crystal structure and size analysis

X-ray diffraction (XRD) is used to analysis the crystal structure of the nanocrystalline ATO particles, as shown in Fig. 4. The results show that the ATO nanoparticles are tetragonal rutile crystal structure. The specific areas are 153 $m^2 \cdot g^{-1}$. Crystallite size of ATO nanocrystalline particles is calculated by using the result of X-ray diffraction and BET.

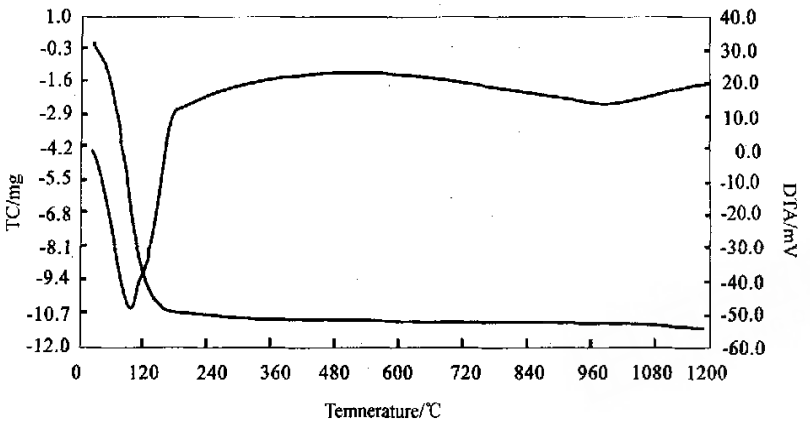

Fig. 2 Thermal gravimetric and differential thermal analysis

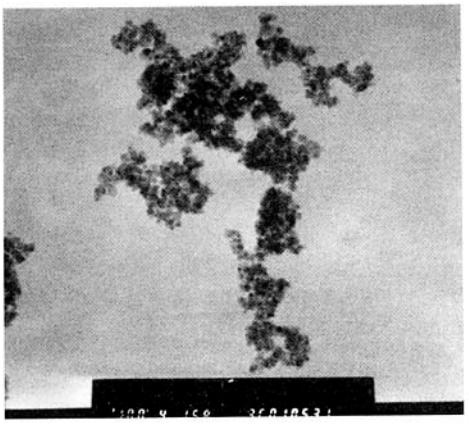

Fig. 3 TEM photograph of the nanocrystalline ATO

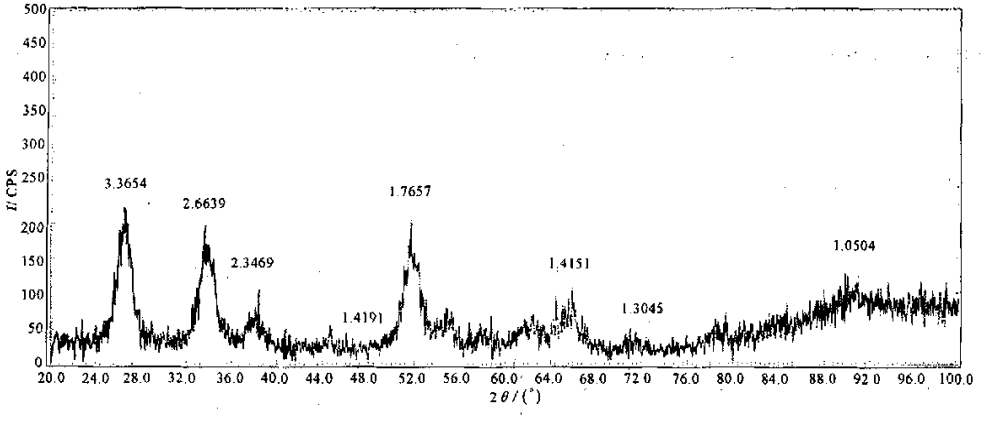

Fig. 4 X-ray diffraction of ATO nanocrystalline paticles

4 Conclusions

(1) Conductive antimony doped tin oxide (ATO) composite nanocrystalline particles are prepared by

hydroxylation method of metal alcoxides. This method has many advantages, such as little pollution, low-cost, simple sheet and equipment.

(2) The ATO nanoparticles is tetragonal rutile crystal structure. TEM show that the particles are monodispersed with weakly aggromation. The size of the particles calcinated at 700 is about 8nm. The specific areas are 153 $m^2 \cdot g^{-1}$.

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Acknowledgement

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