Preparation Method for W18O49 Ultrafine Nanowire
CN 103818964 A

ABSTRACT

The invention discloses a preparation method for a W18O49 ultrafine nanowire. The preparation method has good repeatability and comprises the following steps: a) dissolving WCl6 in triglycol and carrying out magnetic stirring so as to form a blue WCl6 solution; b) transferring the obtained WCl6 solution to a stainless steel hydro-thermal reaction vessel with a polytetrafluoroethylene inner liner, sealing the reaction vessel, carrying out a solvothermal reaction at a temperature of 140 to 200 DEG C for 5 h and subjecting the reaction vessel to natural cooling; and c) subjecting products to centrifugation, carrying out repeated washing with deionized water and absolute ethyl alcohol and then carrying out thorough drying in an air atmosphere at a temperature of 90 DEG C so as to prepare the W18O49 ultrafine nanowire. According to the invention, WCl6 is used as a precusor, triglycol with a high flash point, low vapor pressure, insusceptibility to combustion and blast and extremely low toxicity is used as a solvent, and a solvothermal process is carried out to prepare the W18O49 ultrafine nanowire with a diameter of 0.6 mm; the method has the advantages of easiness, practicability, simple equipment, environment friendliness, good repeatability, high yield and a wide application scope; the prepared W18O49 ultrafine nanowire has controllable morphology and is applicable to fields like gas-sensitive materials, sensors and photo-detectors.

DESCRIPTION

Preparation W18O49 ultrafine nanowires

Technical Field

The present invention relates to the field of nanotechnology materials, particularly to a method for preparing ultrafine W18O49 nanowires.

Background

The tungsten oxide having a variety of crystal structures, while the presence of a large number of ethylene oxide number of non-stoichiometric form, and its chemical formula is usually W03_x (X = O-1). Tungsten oxide is a versatile wide bandgap semiconductor materials, are η-type semiconductors, with significant electrochromic, photochromic, Gasochromic and catalytic properties, can be used in flat panel displays, rewritable optical devices, smart window, sensors and catalysts and other materials.

There are many prepared one-dimensional method of tungsten oxide nanomaterials, such as template method, calcined mesoporous precursor, organic solution synthesis, high temperature oxidation and infrared heating oxidation method. Despite the one-dimensional oxide nanomaterials tungsten preparation methods are many, but there are generally complex process, the production of small shortcomings.

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DISCLOSURE

Technical Problem [0004] The present invention is to solve is: to provide a reproducible method for preparing W18O49 superfine nanowires.

In order to solve the above technical problem, the technical solution of the present invention is used in preparing W18O49 = ultrafine nanowires, comprising the steps of:

a) The WCl6 dissolved in triethylene glycol, and after magnetic stirring, WCl6 blue solution formed;

WCl6 solution b) obtained was transferred to a hydrothermal `Teflon lined stainless steel autoclave, the seal, and then at a temperature of 140 ~ 200 ° C thermal reaction solvent 5h, cooled reactor;

c) The product was centrifuged, after repeated washing with deionized water and ethanol to, at 90 ° C in an air atmosphere sufficiently dried to obtain W18O49 ultrafine nanowires.

[0006] The advantages of the present invention are: to WCl6 as precursor, high flash point, low vapor pressure nonflammable explosion, low toxicity solvent TEG, were prepared Solvothermal W18O49 diameter of ultrafine nanowires 0.6nm The method is simple, simple equipment, environment-friendly, good reproducibility and high yield, widely used, the morphology of ultrafine nanowires prepared W18O49 controllable, can be used for gas sensing materials, sensors, photodetectors, and other fields.

DETAILED DESCRIPTION

The accompanying drawings and the following detailed description of specific embodiments about the specific content of the present invention.

Example 1:

1) 0.4g WCl6 dissolved in 40 ml of triethylene glycol, after magnetic stirring 30 min, the solution formed a blue WCl6;

2) WCl6 solution obtained was transferred to a PTFE lined 50ml Stainless steel water heat ethylene reaction vessel, sealed, and then the solvent at 200 ° C under thermal reaction 5h, cooled reactor;

3) The product was centrifuged, after repeated washing with deionized water and ethanol to, at 90 ° C in an air atmosphere sufficiently dried to obtain a diameter of 0.6nm, a length of about 160nm W18O49 of ultrafine nanowires.

Example 2:

1) 0.4g WCl6 dissolved in 40ml triethylene glycol, after magnetic stirring 30 min, a solution formed a blue WCl6;

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2) WCl6 solution obtained was transferred to a 50ml teflon-lined stainless steel hydrothermal reaction vessel, sealed and then at 180 ° C under a solvothermal reaction 5h, the reaction vessel to cool;
3) The product was centrifuged, after repeated washing with deionized water and ethanol to, at 90 ° C in an air atmosphere sufficiently dried to obtain a diameter of 0.6nm, a length of about 190nm W18O49 of ultrafine nanowires.

Example 3:
1) 0.4g WCl6 dissolved in 40ml triethylene glycol, after magnetic stirring 30min, WCl6 blue solution formed;
2) WCl6 solution obtained was transferred to a 50ml teflon-lined stainless steel hydrothermal reaction vessel, sealed and then at 160 ° C under a solvothermal reaction 5h, the reaction vessel to cool;
3) The product was centrifuged, after repeated washing with deionized water and ethanol to, at 90 ° C in an air atmosphere sufficiently dried to obtain a diameter of 0.6nm, a length of about 180nm W18O49 of ultrafine nanowires.

The synthesized samples by scanning electron microscopy (SEM) and transmission electron microscopy (TEM) morphology characterization, morphology shown in Figure 2. Diameter obtained W18O49 superfine nanowires 0.6nm, a length of about 160 ~ 190 nm. 200 ° C when obtained W18O49 superfine nanowires scattered mesh, 160 ~ 180 ° C when obtained W18O49 superfine nanowires are assembled like clusters.

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