Hydrothermal synthesis of highly oriented hexagonal WO₃ nanowires

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As important device building blocks, one-dimensional (1D) WO₃ nanowires (NWs) have been attracted considerable attentions due to their distinctive physical/chemical properties, making it suitable for application in nanodevices and nanosensors. Among the 1D NWs fabrication approaches, the hydrothermal synthesis method is considered as a promising “soft chemical” process, because this method is able to carefully control the synthesis parameters and perform under a relatively low-temperature. Thus herein, we demonstrate the hydrothermal synthesis of highly oriented hexagonal WO₃ NWs by controlling the amount of sodium sulfate-Na₂SO₄. When increasing the amount of Na₂SO₄, the diameters of the WO₃ NWs were decreased and the length was grown up to 10 micrometers. In addition, the exposed (100) facets of WO₃ NWs were gradually etched with increasing Na₂SO₄, and the cross-sectional shape of the NWs was varied from hexagonal to circular. These results indicate that Na₂SO₄ works as capping agent during WO₃ NWs growth, and therefore plays a crucial role in controlling the macroscopic/microscopic morphologies of the final products.