Synthesis and characterization of $W_{18}O_{49}$ nanorods from W_2N film

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In recent years, the assembly of 1-D nanostructures in the fabrication of transition metal oxides has received increasing attention due to their interesting potential applications. Among these metal oxide nanomaterials, the fabrication of tungsten oxide nanostructures have been intensively studied due to their promising physical and chemical properties. In current study, we report for the first time the synthesis of tungsten oxide nanorods from tungsten-compound material using a simple annealing of the W2N/Si substrate. W2N film was deposited on Si(100) substrate by chemical vapor deposition at 450 ℃ and then heating of the film at 600 ~ 700 ℃ produces a high density of tungsten oxide nanorods. The morphology, structure, composition and chemical binding states of the prepared nanorods were characterized by SEM, XRD, XPS, EDX and TEM measurements. XRD and TEM analysis showed that the grown nanorods were single-crystalline W18O49. According to XPS analysis, the W18O49 nanorods contained ~62% of W6+ , ~28% of W5+ , and ~10% of W4+ . Field emission measurements showed a low turn-on field of 9.5 V/μm for the W18O49 nanorods, indicating that they can be used as potential field emitters.