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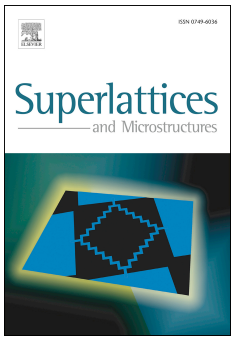

Synthesis of hexagonal ultrathin tungsten oxide nanowires with diameters below 5 nm for enhanced photocatalytic performance

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Synthesis of hexagonal ultrathin Tungsten oxide nanowires with diameters below 5nm for enhanced photocatalytic performance

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Abstract: Semiconductor with one dimension (1D) ultrathin nanostructure has been proved to be a promising nanomaterial in photocatalytic field. Great efforts were made on preparation of monoclinic ultrathin tungsten oxide nanowires. However, non-monoclinic phase tungsten oxides with 1D ultrathin structure, especially less than 5 nm width, have not been reported. Herein, we report the synthesis of hexagonal ultrathin tungsten oxide nanowires (U-WO_x NW) by modified hydrothermal method. Microstructure characterization showed that U-WO_x NW have the diameters of 1-3 nm below 5 nm and are hexagonal phase sub-stoichiometric WO_x. U-WO_x NW show absorption tail in the visible and near infrared region due to oxygen vacancies. For improving further photocatalytic performance, Ag co-catalyst was grown directly onto U-WO_x NW surface by in situ redox reaction. Photocatalytic measurements revealed hexagonal U-WO_x NW have better photodegradation activity, compared with commercial WO_3(C-WO_3) and oxidized U-WO_x NW, ascribe to larger surface area, short diffusion length of photo-generated charge carriers and visible absorption of oxygen-vacancy-rich hexagonal ultrathin nanostructures. Moreover, the photocatalytic activity and stability of U-WO_x NW using Ag co-catalyst were further improved.

Keywords: Hexagonal; Tungsten oxide; Ultrathin nanowires; Hydrothermal synthesis; Photocatalytic