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Review

Gas sensors based on anodic tungsten oxide

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ABSTRACT

Nanostructured porous tungsten oxide materials were synthesized by the means of electrochemical etching (anodization) of tungsten foils in aqueous NaF electrolyte. Formation of the sub-micrometer size mesoporous particles has been achieved by infiltrating the pores with water. The obtained colloidal anodic tungsten oxide dispersions have been used to fabricate resistive WO_3 gas sensors by drop casting the sub-micrometer size mesoporous particles between Pt electrodes on Si/SiO_2 substrate followed by calcination at 400 °C in air for 2 h. The synthesized WO_3 films show slightly nonlinear current–voltage characteristics with strong thermally activated carrier transport behavior measured at temperatures between −20 °C and 280 °C. Gas response measurements carried out in CO, H_2, NO and O_2 analytes (concentration from 1 to 640 ppm) in air as well as in Ar buffers (O_2 only in Ar) exhibited a rapid change of sensor conductance for each gas and showed pronounced response towards H_2 and NO in Ar and air, respectively. The response of the sensors was dependent on temperature and yielded highest values between 170 °C and 220 °C.

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