Phase evolution, microstructure, and gas-sensing properties of the $Fe_2(MoO_4)_3$ system

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A ferric molybdate $Fe_2(MoO_4)_3$ aerogel has been synthesized. Crystal structure of sintered samples in a range of temperature (500-750 ºC) was analyzed using X-ray diffraction (XRD). The thermal decomposition process was studied by thermogravimetric analysis (TG), which showed that the weight loss starts at about 800 ºC. The morphology of samples was observed by scanning electron microscopy (SEM). Crystallite sizes in the range from 150 to 250 nm were obtained. An introduction to the $Fe_2(MoO_4)_3$ semiconductor gas sensor and its electrical characterization is presented, followed by details of the method of thick film preparation. The basic measurement is the conductance of the sensor. The ferric molybdate displays a good chemical affinity for H_2S. Upon exposure to this gas at moderate temperature (250-300 ºC) there is formation of metal sulfides and sulfates, which are partially remained on the surface after “the gas out”. The response of prepared thick-films to H_2S gas in the concentration range from 10 to 50 ppm in air was investigated as a function of the sintering conditions. It is important to notice that at low operating temperature there was no considerable drift of the output response associated usually with the ongoing process of bulk equilibration. The gas sensitivity of ferric molybdate films sintered in a range of temperature (600-750 ºC) becomes low, due to the high crystallinity of film, but when sintered at 500 ºC, the film represents poor crystallinity, and respectively good sensitivity to gas.