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Fabrication and Surface Analysis of Nano-sized Tungsten Oxide Based Powders as Selective Sensors towards Nerve Agent Simulant

Sofian M. Kanan
Department of Biology, Chemistry, & Environmental Sciences. American University of Sharjah, United Arab Emirates

Several synthetic approaches were used to obtain nano-sized porous and monoclinic WO_3 (m-WO_3) powders. All of these methods begin with a standard preparative method where H_2WO_4 is first generated by passing a Na_2WO_4 solution through a cation-exchange resin. It is shown that high surface area particles are produced by dripping the H_2WO_4 exiting from the ion exchange column into a solution containing oxalate and acetate exchange ligands or alternatively, into a water-in-oil (w/o) based emulsion. The porous WO_3 powders were prepared using a standard synthetic method for MCM 41. The surface properties were investigated by the water desorption isotherm, the pyridine adsorption, and the adsorption properties of dimethyl methyl phosphonate (DMMP) that are monitored by FTIR spectroscopy. The adsorption properties was found to depend on the initial evacuation temperature of the WO_3 surface as this alters the relative number of the Lewis and Brønsted acid sites along with the amount of adsorbed water. Tailoring the architecture of WO_3 powders leads to a new size selective approach to improving selectivity in semiconducting metal oxides (SMO) sensors. The key for achieving high selectivity is based on using a dual sensor configuration where the response on a porous WO_3 powder sensor was compared to the response on a nonporous WO_3 powder sensor. Detection selectivity between methanol and dimethyl methyl phosphonate (DMMP) is obtained because the access of a gas molecule in the interior pore structure of WO_3 is size dependent leading to a size dependant magnitude change in the conductivity of SMO sensor.

Biography:

Sofian Kanan received his B.Sc. and M.Sc. degrees from Yarmouk University in 1989 and 1991, respectively. He earned his Ph.D. in Inorganic & Material Chemistry from the University of Maine in 2000 and he worked as a Research Associate at the Laboratory for Surface Science & Technology (LASST), University of Maine for two years. He also worked as a Senior Scientist at Sensor Research and Development Corporation (SRD-Corp.) for one year. In 2003, he started his academic career as an Assistant Professor at the American University of Sharjah (AUS) where he was promoted early to the rank of Professor of Chemistry in 2012. Prof. Kanan has received a number of awards and grants for his teaching and research activities. He is an Editorial Board Member of *Scientific Reports*, *Research on Chemical Intermediates, and Cogent Environmental Science Journals*. His research interests fall under the general umbrella of developing material properties through the use of surface chemistry. Specifically, Dr. Kanan's work is centered on the development and use of different spectroscopic techniques to probe reactions at the solid/liquid and solid/gas interface. The primary goal of his research is to obtain an understanding of the relationship between the molecular surface chemistry and macroscopic properties of materials.