Synthesis and chemical gas sensing properties of WO3 nanomaterials

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Nowadays, sensing systems have become a necessary part of our daily lives including healthcare and environmental safety. Semiconductor nanostructures are very promising materials for the fabrication of high-performance gas sensing devices owing to their unique physical, chemical and electronic properties. However, the improvement of their functionalities to satisfy the requirements of sensing technologies is a challenging issue. Herein, we report a novel synthesis method for the fabrication of WO3 nanostructures. We performed the synthesis of nanomaterials by the thermal treatment of tungsten thin films using sodium chloride and distilled water. We examined the effect of water, sodium chloride and water vapor on the growth of WO3 nanostructures. The morphological, compositional and structural analysis of prepared samples demonstrates that it is possible to prepare porous structures composed of WO3 nanoparticles in an aqueous solution of sodium chloride and under exposure to water vapor. The studies of the gas sensing properties of materials indicate that they have a highly selective response to acetone. In the meantime, our investigations show that the monoclinic γ-WO3 structure is more reactive and

selective to acetone compared to the orthorhombic β-WO3. This feature can be attributed to the catalytic activity and large dipole moment of monoclinic γ-WO3. Hence, we provide a new strategy for the preparation of WO3 nanomaterials based on eco-friendly methods and their application in health and environmental monitoring.