Electronic and structural properties of Mn-doped WO3 and its use as an ozone gas sensor

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Semiconductor sensors can be successfully used to detect oxidizing gases, such as ozone (O3). Among the semiconductor materials studied, WO3 stands out for the possibility of obtaining a crystalline structure and variable particle size due to the synthesis method used. There are works in the literature that bring the use of expensive metals such as Au, Ag, Pt and Pd, however, the high cost of noble metals reduces the potential for application of this strategy. In this work, samples of WO3:Mn (1, 2, 4 and 8% mol) were synthesized using the coprecipitation method followed by microwave hydrothermal treatment, and calcined at 800°C in a conventional oven. These samples were analysed by XRD, Raman, FTIR, XRD and SEM. Through XRD, Raman and FTIR analysis, it can be observed that all samples obtained correspond to WO3 with orthorhombic phase, without the formation of undesirable secondary phases. Through SEM analysis, it was observed that with increasing Mn concentration in the crystal lattice, the morphology of WO3 changed from irregular polygons to cubes, showing that Mn acts on the surface energies of the WO3 crystals obtained. For the O3 gas sensitivity test, it was observed that the WO3 sample doped with 8% Mn presented a sensitivity 4 times greater than the pure sample.

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