

Gate Voltage Controlled Humidity Sensing Using MOSFET of VO₂ Particles

Authors : A. A. Akande, B. P. Dhonge, B. W. Mwakikunga, A. G. J. Machatine

Abstract : This article presents gate-voltage controlled humidity sensing performance of vanadium dioxide nanoparticles prepared from NH₄VO₃ precursor using microwave irradiation technique. The X-ray diffraction, transmission electron diffraction, and Raman analyses reveal the formation of VO₂ (B) with V₂O₅ and an amorphous phase. The BET surface area is found to be 67.67 m²/g. The humidity sensing measurements using the patented lateral-gate MOSFET configuration was carried out. The results show the optimum response at 5 V up to 8 V of gate voltages for 10 to 80% of relative humidity. The dose-response equation reveals the enhanced resilience of the gated VO₂ sensor which may saturate above 272% humidity. The response and recovery times are remarkably much faster (about 60 s) than in non-gated VO₂ sensors which normally show response and recovery times of the order of 5 minutes (300 s).

Keywords : VO₂, VO₂(B), MOSFET, gate voltage, humidity sensor

Conference Title : ICCMP 2017 : International Conference on Condensed Matter Physics

Conference Location : Sydney, Australia

Conference Dates : January 26-27, 2017