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Gas phase interactions with Au nanoparticles decorated GaN nanowires by X-ray photoelectron spectroscopy I.B. NIRAULA, B.A. FOUETIO, M. DEHART, M. MARTINEZ, D.N. MCILROY, Dept. of Physics, Univ. of Idaho, USA, M.G. NORTON, School of Mech. and Mat. Eng., Washington St. Univ., USA — Au nanoparticle coated GaN (Au-GaN) nanowires have been shown to exhibit gas sensing capabilities, yet virtually nothing is known about the interactions of gases at the surface of Au-GaN nanowires. The electronic surface structure and the gas adsorption behavior of the nanoparticles have been examined by X-ray photoelectron spectroscopy (XPS). The interaction of gold nanoparticles as a function of CO, H₂O and O₂ exposures was investigated by examining binding energy shifts of the Au 4f, C1s and O1s electron core level states at 298 K, 77 K and 14 K. XPS analysis reveals that for T= 298 K and T=77 K for all gases the interaction with the surface of the Au-GaN nanowires is too weak to be observed on the timescale of XPS. However at T=14K binding energy shifts of the Au 4f, C1s and O1s electron core level states occur, indicative of adsorption onto the Au-GaN nanowire surface. The temperature dependence of the gas adsorption indicates that the interaction of all the gases investigated is physisorption.

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