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Dynamic Oxidation of Gallium Phosphide Surface Tracked by Near Ambient Pressure XPS[1] SYLWIA PTASINSKA, XUEQIANG ZHANG, University of Notre Dame — Both from applied and fundamental points of view, it is important that we have a detailed molecular-level understanding of gas-solid interface interactions, especially under operational conditions. Recent progress in *in-situ* instrumentations (e.g., Near Ambient Pressure X-ray Photoelectron Spectroscopy—NAP XPS), has enabled us to explore the physicochemical processes at the gas-solid interface over a varied range of pressures (up to mbar range), bridging the gap in our knowledge of interfacial interactions. Our recent investigations have focused on dissociative adsorption of small gas-phase molecules onto III-V semiconductors, which leads to surface oxidation. In this work, we carried out a pressure- and temperature-dependent study of GaP(111) oxidation in an O_2 environment. Dynamic changes in chemical evolutions at the O_2/GaP(111) interface were reflected in Ga $2p_{3/2}$, O 1s, and P 2p spectra. Different oxidation states were observed, involving Ga_2O, Ga_2O_3 and $GaPO_4$ formation. A "phase diagram" of GaP(111) oxidation under various O_2 pressures and temperatures can help us visualize transition states and gain more insights into chemical pathways leading to the final products of GaP oxidation. Further, an estimation of work function changes of the oxidized GaP surface was obtained under near ambient conditions.

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