Abstract Submitted
for the OSS11 Meeting of
The American Physical Society

Enhanced chemical sensing in the visible and near-UV utilizing amorphous, nanostructured photonic waveguides SONJA ABBEY, AARTHI SRINIVASAN, TARAVENI CHALASANI, Ohio University, GINES LIFANTE, Universidad Autónoma de Madrid, KRISHNA MANOHARAN, RALPH WHALEY, Ohio University — While extensive research has been conducted on the development and analysis of integrated photonic chemical sensors in the IR and near-IR regions, there has been relatively little work done in the visible and near-UV mostly due to the substantial absorption of group-IV and III-V materials in that wavelength range. This work focuses on the design of novel, nanoscale photonic architectures and materials for the application of enhanced chemical sensing in these wavelength regions. Specifically, this project uses ammonia (NH3) and titanium tetrachloride (TiCl4) as the study analytes and focuses on platforms composed of amorphous zinc oxide (a-ZnO) and amorphous hafnium dioxide (a-HfO2). Having an effective bandgap of 3.37 eV and 5.8 eV, respectively, and grown by rf sputtering on a wide variety of substrates at low temperature, a-ZnO and a-HfO2 are highly compatible with standard photonic device fabrication processes. Utilizing a low optical overlap mode (LOOM) architecture, in which only 1 percent of the optical mode resides in the core region, we predict a markedly higher sensitivity than conventional evanescent wave sensors - between 5X and 50X depending on polarization and host environment.

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Date submitted: 14 Mar 2011 Electronic form version 1.4