Integrated Nanophotonic Sensing, Spectroscopy, and Signal Processing

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An integrated micro-opto-electro-mechanical (MOEMS) system is presented that functions as a new type of spectrometer for ultraviolet (UV) through visible (VIS) and near infrared (NIR) spectroscopy. Integrated with the system are components using electron tunneling in nanoscale tunnel junctions. Also included are sensors based upon suspended waveguides and silicon microcantilevers. An application specific integrated circuit for short-range telemetry and temperature sensing is used for portions of the input and output. The micro-optical UV/VIS/NIR spectrometer is based upon surface plasmon excitation in aluminum, silver, and gold films. Absorption spectra, emission spectra, and other spectra are presented to demonstrate the resolution and stray light rejection qualities of the system.

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