

*Using Optoelectronics
for Chemical and
Environmental Sensing*

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The human body naturally emits trace amounts of about 500 chemicals. Likewise, the atmosphere contains hundreds of chemicals that, in trace amounts, do not adversely affect our breathing or health. When these chemicals become out of balance—such as from illness, chemical weapons, or hazardous waste—often only complex chemical testing can diagnose their presence.

Because every molecule has a unique absorption signature, optoelectronic devices hold the promise of providing effective identification of chemicals, by analyzing a molecule's absorption. For example, light from a semiconductor laser could pass through the molecules in a person's breath, the absorption could be measured and determination made—within minutes—about what chemicals are present and in what amounts. By providing fast and effective trace gas detection, this technology has application in environmental sensing (measuring the atmosphere for pollutants), industrial process control (chemicals and food products) and medical diagnostics.

Wen Wang is an eminent researcher in optoelectronic materials, devices, and molecular beam epitaxy. He focuses his research on creating knowledge that can be applied to real-world problems. His current projects include nano and heterostructure material properties, optoelectronic devices, infrared lasers, detectors, and photovoltaics.

He has contributed some 250 papers and published extensively in this area, e.g. Type-II InAs/GaSb superlattices for mid- and long-wavelength applications (Quantum Structure Infrared Photodetectors International Conference, 2010, Istanbul, Turkey); High detectivity InGaAsSb photodetectors with cutoff wavelength up to 2.6 μm (J. Crystal Growth, 2009); Interface and optical properties of InGaAsNSb quantum wells (very low threshold 1.3 μm lasers, J. Vac. Sci. Tech. 2007); Mid-infrared InGaAsSb quantum well lasers with digitally grown tensile-strained AlGaAsSb barriers (J. Vac. Sci. Tech. 2007); Strain-compensated InGaAsSb quantum well lasers emitting at 2.43 μm (environmental and glucose sensing, IEEE PTL, 2005); Invention of a new quinary dilute nitride InGaAsSbN for mid-infrared optoelectronic devices (JAP 2003 and APL 2001).

Wang is a fellow of the Institute of Electrical and Electronics Engineers, the American Physical Society, John Simon Guggenheim Foundation, and is an Electron Device Society distinguished lecturer.

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