
KL-5**Current status of mid-infrared quantum and interband cascade lasers based trace gas detection in exhaled breath****F. K. Tittel, W. Ren, W. Jiang and Y. Cao***Department of Electrical & Computer Engineering, Rice University, Houston, TX, USA
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This talk will focus on recent advances in the development of trace gas sensor technologies based on mid-infrared interband cascade and quantum cascade lasers for the detection, quantification and monitoring of trace gas species and their application in medical diagnostics, life sciences and public health [1–4]. For example, potential disease biomarkers for asthma, renal failures, diabetes and cancer have been the driving force for the development of analytical instruments based on laser spectroscopy. Breath analysis is a method for gaining non-invasive and accurate information on the clinical state of an individual by monitoring volatile organic compounds present in exhaled breath instead of blood tests. Specifically, the spectroscopic detection and monitoring of seven molecular species, ammonia (NH₃), nitric oxide (NO), carbon monoxide (CO), sulfur dioxide (SO₂), methane (CH₄), nitrous oxide (N₂O) and hydrogen peroxide (H₂O₂) will be described. These molecules were detected using conventional photoacoustic and quartz-enhanced photoacoustic spectroscopy (PAS & QEPAS). PAS and QEPAS can achieve minimum detectable absorption losses in the range from 10⁻⁸ to 10⁻¹¹ cm⁻¹/√Hz.

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