APPLICATIONS OF NEAR-INFRARED LASER SPECTROSCOPY TO BREATH ANALYSIS

STEVEN W. SHARPE, THOMAS A. BLAKE and ROBERT L. SAMS, *Pacific Northwest National Laboratory, P. O. Box 999, Mail Stop K8-88, Richland, WA 99352. (PNNL is operated for the US Department of Energy by the Battelle Memorial Institute under contract DE-AC06-76RLO 1830.).*

Small infrared active molecules such as ammonia, carbon monoxide, carbon dioxide, methane and ethane are present in exhaled breath and can be readily detected by laser absorption spectroscopy. In addition, many of the stable isotopomers of these molecules can be accurately detected, making it possible to follow specific metabolic processes. Potential areas of applications for this technology include the diagnosis of certain pathologies (e.g. Helicobacter pylori infection), detection of trauma due to either physical or chemical causes and monitoring nutrient uptake (i.e., malnutrition).

Applications of tunable infrared semiconductor lasers to breath analysis have been reported in the literature by a number of researchers.[a] Advantages of laser absorption over more conventional techniques such as Fourier transform infrared (FTIR) and non-dispersive spectrscopy include higher sensitivity, greater spectral resolution, faster data acquisition and potentially compact packaging of the apparatus for field deployment. In this talk, we present some of our results associated with laser absorption studies on human breath and its application to diagnosis of diseases and pathologies.

[a] K. D. Thrall, J. J. Toth and S. W. Sharpe, SPIE Volume 2676, 136-146 (1996)