V Zeninari, J Phys Chem Biophys 2014, 4:5
http://dx.doi.org/10.4172/2161-0398.S1.007

OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Conference and Exhibition on
Lasers, Optics & Photonics
September 08-10, 2014 Hilton Philadelphia Airport, USA

The MIRIADE project: A mid infrared integrated photo-acoustic spectrometer device for environment survey

V Zeninari[1], **M Carras**[2], **J Rouxel**[1,3], **A Glière**[3], **M Brun**[3], **S Nicoletti**[3], **R Vallon**[1] and **B Parvitte**[1]
[1]Université de Reims, France
[2]III-V Lab, France
[3]CEA-Leti, France

In the framework of the French National Research Agency project called MIRIADE (#ANR-11-ECOT-004), GSMA, III-V Lab and CEA Letidevelopeda novel detection architecture where a multi-wavelength Quantum Cascade Lasers (QCL) source is associated with a photoacoustic (PA) cell, all integrated on a single chip, to realize miniaturized optical gas sensors working in the mid-IR (MIR) range. Gas sensor technology based on optical detection has already proven to be crucial for various aspects in our modern society. However, available optical gas sensors are bulky, complex and have a very high cost of ownership. The consequence is that they are not suitable for mass deployment, for instance in sensor networks. Among possible improvements, miniaturization of the gas sensor and associated cost reduction are of primary importance in many application areas with very high socio-economic implications. PA detection is a powerful technique for gas detection at trace level based on optical absorption and subsequent thermal perturbation of the gases. The realization of a miniaturized and integrated photoacoustic cell (μ-PA) in association with multi-wavelength QCL source would be of great interest to expand the use of such sensors because the detection characteristics scale favourably when the system dimensions are decreased. Using the finite element method based model, which takes into account thermo-viscous acoustic effects, the signal and frequency behavior of the miniaturized and integrated PA detector will be presented. Furthermore, using Si technologies enables to benefit from the massively parallel integration capabilities. However, several technical bottlenecks must be overcome, mainly regarding the integration of laser source, photonic integrated circuit and MEMS microphones. In this concern, it has been shown that detection in the MIR range can be made efficiently with QCL coupled with MIR waveguides. Moreover, MEMS microphones are now widely available, as demonstrated by their use in smartphones. These achievements open the way for a full integration of a μ-PA module on a single chip.This poster will present some major achievements in the realization of such a miniaturized optical sensor.

Biography

V Zeninari has completed his PhD in 1998 at the age of 26 years from University of Reims, France and Postdoctoral studies in 1999 at Montpellier University, France. She is currently the leader of team “Laser spectroscopy and applications” from GSMA - Reims. She has published more than 70 papers in reputed journals and has more than 10 patents.

virginie.zeninari@univ-reims.fr