

Light Emitting Diodes as Light Sources for Portable Analysis: Sensing of Atmospheric Methane with Rapidly Pulsed IR-LEDs and Applicability to UAV Based Monitoring

Mirek Macka¹, Ansara Noori¹, Parvez mahbub¹, John S. Parry², Arko Lucieer³, John Davis²

¹Australian Centre for Research on Separation Science (ACROSS) and School of Physical Sciences University of Tasmania, Private Bag 75, Hobart 7001, Australia, email:

Ansara.noori@utas.edu.au, Parvez.mahbub@utas.edu.au, Mirek.macka@utas.edu.au

²Central Science laboratories, University of Tasmania, Private Bag 74, Hobart 7001, Australia, email: J.s.parry@utas.edu.au, john.davis@utas.edu.au

³School of Land and Food, University of Tasmania, Private Bag 76, Hobart 7001, Australia, address, email: Arko.lucieer@utas.edu.au

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Abstract:

Solid state light sources (SSLs) are dubbed the light sources of the 21st century not without compelling reasons. Light emitting diodes (LEDs) are becoming leading light sources in lighting, but also in many other areas including science, and specifically environmental science and remote sensing. Chemical analysis profits from numerous benefits of SSLs and LEDs. The first part of this talk will provide a critical assessment of their strengths but also weak points, and outlook into the future of SSLs and LEDs in chemical analysis.

Portable analysis is the area where the small size, low weight and robustness of SSLs and LEDs as light sources have provided key enabling push. In the second part of this talk we will have a brief look at the types of portable analysis and specifically the types fitting under general analysis areas based on (i) wet chemistry, (ii) solid sensors such as electrodes, (iii) other physicochemical methods such as spectral, and (iv) sensors for physical parameters, and why are they represented in portable analysis in very different proportions.

Spectral analysis combines the advantages of mostly avoiding the challenges of wet chemical analysis, while having the ability to provide through some of the spectral methods very sensitive and/or selective response for almost every chemical species. In its third part, this talk will present the main points of our work using NIR and mid-IR LEDs rapidly pulsed with pulses of only ca 2 μ s using an in-house designed programmable pulse generator, and with on-the-fly data acquisition and processing. This analyser has been 'walked' around a local landfill sensing for methane, with methane concentration data aligned through the time axis with GPS coordinates provided through a smart phone app to provide 3D spatial distribution plots. The positives and critical aspects of the approach especially in comparison with IR lasers will be discussed.