Life science trace gas facility: a way towards top-research on biological systems

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Ethylene (C_2H_4) is a plant hormone involved in many aspects of the plant life cycle, as well as in the plants response to many environmental stimuli. Over the years the laser-based detectors have been used for online monitoring of ethylene production in various processes in plants and microorganisms, such as germination (Petruzzelli *et al*., 1995; Thuring *et al*., 1994), growth, flower and fruit development, senescence of plant organs (Woltering *et al*., 1993; Wagstaff *et al*., 2005), programmed cell death, plant defense, biotic stress (e.g. pathogen attack) (Cristescu *et al*. 2002) and abiotic stress conditions (e.g. wounding, hypoxia, drought, heat, chilling and freezing) (Leprince *et. al.*, 2000), interaction with auxin (Van der Bussche *et al*., 2003), circadian rhythm (Thain *et al*, 2004), nitrogen fixation by cyanobacteria (Staal *et al*., 2003), etc.

The strength of these instruments resides in the possibility to perform non-invasive, fast (seconds timescale) and online detection of ultra low gas concentrations at and below the ppbv-level (1 ppbv = 1 part per billion volume = $1:10^9$) under rapidly changing external conditions (Harren and Reuss, 1997).

With more than 20 years of experience with applications in life science, the Trace Gas Facility from Nijmegen is offering free access, training and full support to researchers engaged in experiments where high sensitivity measurements are important to determine the character and the timing of the observed processes. With our unique state-of-the-art detectors, traces of ethylene and also other biological interesting gases from plants, fruits, algae, bacteria, fungi, insects, breath, human skin, culture media, etc. can be monitored under rapidly changing conditions (e.g. temperature, O_2-, CO_2-levels, biotic stress, etc.) in a seconds timescale and without incubation periods.

Among ethylene, other components of biological interest can be monitored in real time with the laser-based photoacoustic detectors and proton

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transfer reaction mass spectrometer (PTR-MS), such as nitric oxide, ethane, higher aldehydes (e.g. formaldehyde, acetaldehyde, propanal, etc.), ketones, alcohols (e.g. methanol, ethanol, propanol, iso-propanol, *n*-propanol, etc.), acids (e.g. formic acid, acetic acid, propanoic acid, etc.) and esters as well as many unsaturated, aromatic and N or S substituted hydrocarbons. Examples of applications are numerous and can be found on the web site www.ru.nl/tracegasfacility).

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