Tunable Diode Laser Spectroscopy (TDLAS)

Nanosystems and Technologies GmbH
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TDLAS exploits the rotational vibrational absorption features of gases for semiconductor laser-based trace gas detection. Sometimes it is referred to as TDLAS, TLS, TLAS or (with a reference) as TDLARS.

Key features of TDLAS

TDLAS is a very strong tool for highly selective and sensitive measurements. It enables:
- ✓ sensitive detection of ppm to ppb (or even ppt!) level concentrations
- ✓ in situ measurements
- ✓ contactless techniques
- ✓ operation at or above room temperature
- ✓ measurement of sticky gases
- ✓ portable gas detectors

Compared to other highly sensitive technologies, such as gas chromatography TDLAS instruments show
- ✓ high selectivity
- ✓ low cost of ownership
- ✓ fail-safe operation

Concept of TDLAS

TDLAS is one of the most sensitive, selective and robust technologies for trace gas monitoring.
It is based on the Lambert-Beer law which states a logarithmic relation between the
- transmission of light through a gas
- product of the attenuation coefficient of the gas
- distance the light travels through the gas

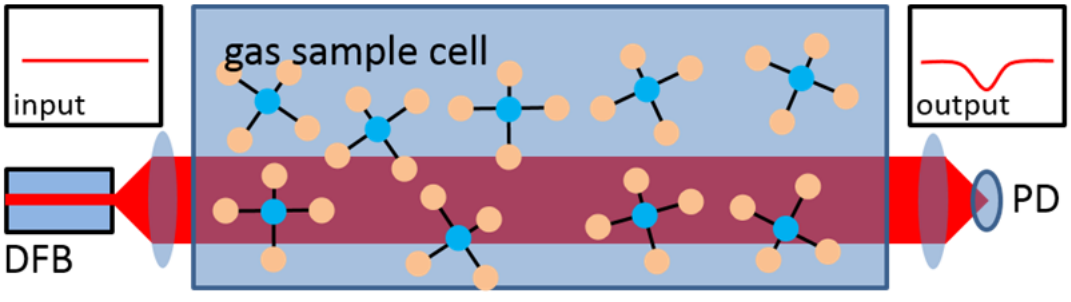
When a gas has an absorption feature at a specific wavelength, the transmitted intensity declines exponentially with: $I(\nu,t) = I_0(\nu)\, e^{-S(T)\, g(\nu,\nu_0)\, n\, L}$

With n being the number density of the molecular absorbers, $I_0(\nu)$ the initial laser intensity and $I(\nu,t)$ the intensity detected after the probe with an absorption length L.

The absorption line profile is characterized by the temperature-dependent, spectrally integrated line strength S(T), and the normalized (area=1) shape function $g(\nu,\nu_0)$, centered at the wavelength ν_0 .

Standard TDLAS setup

A standard TDLAS setup is illustrated below. It consists of:
- a wavelength tuning DFB laser; emitting monochromatic light at the absorption line of the trace gas
- an optical lens to collimate the laser light
- a gas sample cell; in this case filled with CH_4
- a photo detector on which the laser light is focused; measuring the transmission



ATTENTION! OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICE

nanoplus
Nanosystems and Technologies GmbH
Oberer Kirschberg 4
D-97218 Gerbrunn

phone: +49 (0) 931 90827-0
fax: +49 (0) 931 90827-19
email: sales@nanoplus.com
internet: www.nanoplus.com

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