Photon Density Wave (PDW) Spectroscopy Factsheet

Contact information

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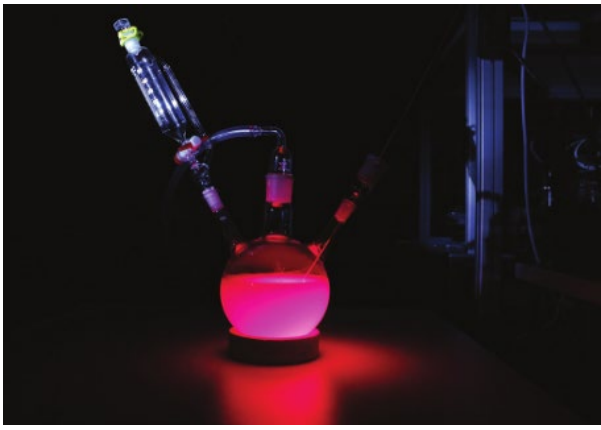


Technical information

Photon Density Wave (PDW) Spectroscopy is an innovative fiber-optical Process Analytical Technology (PAT) which characterizes the optical properties of emulsions or suspensions. Additionally, dilution-free particle sizing in the nanometer and micrometer scale is its unique virtue. With its pure fiber-optical probe, this technology is very easy to install inline or online in any (bio)chemical or physical process, as e.g. in fermentation, polymerization, or homogenization reactors.

Technical specifications

Working conditions:

Implementation of the PDW process probe in a reaction plant (typical 10 - 80 °C), installation of the PDW spectrometer under ambient conditions

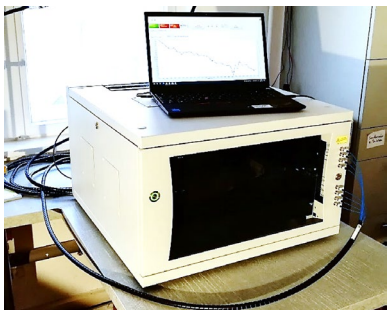
Probe installation by various adapters:

weld-on flange, TriClamp, Ingold, Compression fitting

Connexions to the systems/how the flow works:

The probe is connected to the spectrometer by optical fibers of typically 10 m length. The probe is inserted into the reactor for performing the measurements.

Size of device:



width: 600 mm

depth: 600 mm

height: 350 mm

Measurable particle size range:

approx. 50 nm - 500 µm (diameter)

This project has received funding from the Horizon 2020 Framework Programme of the European Union under grant agreement n° 862583.

ATEX:	Process probe technology intrinsically safe due to electronics-free, low laser light intensity design. Spectrometer not ATEX ready
Laser power:	approx. 5 mW
Typical probe materials:	stainless steel, glass, PTFE. Customer specific development possible
Probe:	Depends on application; typical diameter range is 19 - 25 mm, typical length is 20 - 150 cm. It contains no movable or electronic parts
Time resolution:	approx. 2 per minute

Benefits

- Dilution-free, real-time process monitoring in heterophase systems with respect to particle/droplet dynamics including sizing
- Applicable also to viscous systems and systems under stirring
- User perspective: Implementation in a DCS for real-time control of heterophase processes, mainly with respect to control particle size

Applications

- Light scattering materials / Highly turbid liquid dispersions (typically liquid suspensions or emulsions with a content of particles or droplets in between 0.1% to more than 50%)
- Characterisation of optical coefficients, particle size, composition analysis, dependent light scattering, optical design, particle stability, particle interactions
- Sectors of application:
    - Polymers
    - Food stuff
    - Biotechnology
    - Cosmetics

Application examples are found here: www.pdw-analytics.de/applications/

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Key parameters in comparison with other methods

Method	Dynamic Light Scattering (DLS)	Nanoparticle Tracking Analysis (NTA)	Laser Diffraction	PDW spectroscopy
Integration into the production process	Limited	No	Possible	Yes
Measurement of particle concentration	Limited	Limited	No	Limited
Measurement of particle size distribution for monodisperse samples	Yes	Yes	Yes	Yes
Measurement of particle size distribution for polydisperse samples	Difficult	Difficult	Difficult	Difficult
Detection range (particle size)	1 nm to 10 µm (sample-dependent)	10 nm to 1 µm (sample-dependent)	10 nm to 3 mm (sample-dependent)	50 nm to 500 µm (sample-dependent)
Monitoring of dynamic processes	Limited	Limited	Limited	Yes
Application to highly concentrated dispersions	No	No	No	Yes

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