particle technology
PALAS® PARTICULAR 1 | 2009

INFORMATION FOR CUSTOMERS AND PARTNERS OF PALAS® GMBH

PALASCOUNTS

Promo 3000 measures at biofuel project

Palas® technology fulfils requirements for challenging gas cleaning procedure in the "bioliq" project at the Forschungszentrum Karlsruhe

▶At the Forschungszentrum Karlsruhe, scientists are working on the extraction of fuel from straw and wood waste. An important field in the pilot project "bioliq" is the gas cleaning. For this procedure, currently a test phase with a pilot plant carburettor in smaller scale is prepared. With the necessary particle measurement technology, the choice fell on the new scattered light spectrometer system Promo 3000.

"After the gasification, we have to work up the raw gas for the fuel synthesis", declares Dipl.-Ing. Robert Mai from the Institute for Technical Chemistry, Division Thermic Waste Treatment. Among other things, impurities like soot particles, sulfur and hydrogen chloride as well as ammonia have to be separated, in order to shelter the synthesis catalysts. This is done by means of a high-temperature ceramic filter and a sorption system. The particle measurement technology in use has to face particular difficulties due to the flammability of the synthesis gas, high temperatures and a high pressure. The actual procedure shall be conducted at approximately 600 °C and 80 bar. But also in the pilot plant system have to be reached at least 200 °C in order to avoid condensations. The Promo 3000 will be used for measuring the particle concentrations and particle distributions being relevant for the filtration and cleansing conditions. In the process, the device can be used for system control via a Modbus RTU interface and can be integrated in process control systems. "Under 80 bar pressure, the optical access to a syngas has not been possible yet", says Mai. For that reason, first of all a secondary flow shall be separated, cooled down to 200 °C and lead to the aerosol sensor without pressure.

Dipl.-Ing. Robert Mai at the pilot plant system of the bioliq project

Digital individual signal processing provides measurement in high concentrations

"In fact, the determination of the particle concentrations and sizes with the high particle loading of some g/m³ in the raw gas and at such high temperatures is only possible with the Palas® system", declares Mai. Common aerosol spectrometers are here overstrained. Due to an integrated digital processor technology with individual signal analysis and coincidence analysis according to Dr. Umhauer and Prof. Sachweh, Promo, however, makes the unambiguous determination of the particle concentration and the particle size possible in concentrations up to 10^6 P/cm³. Especially for the measurement in hot raw gas, Palas® has developed the new high-temperature sensor 2070 H.

Due to the flammability, the explosion protection was also important, said Mai. Another advantage is that two sensors for the raw and clean gas measurement can be connected via optical fibers: While the sensor 2070 H is being used in the raw gas, the sensor 2300 H is being employed in the clean gas with very low particle concentrations of less than 10 mg/m³.

In Promo 3000, an automatic and optical switch between raw and clean gas sensor is integrated which makes a quasi simultaneous filter testing possible. In order to further approach the target process conditions, it is also planned to develop a sensor in co-operation with Palas® which can be flanged directly on the duct.

Dear Readers,

In practical use, our products have to contribute effectively to the improvement of quality and the reduction of operating expenses. Therefore, we are permanently working on new technologies and concepts.
In this issue of Palas® Particular we present our latest developments.
The well-proven welas® system has been upgraded with a modern digital electronics with a digital individual signal processing and a special software for a precise coincidence correction. The new device generation is characterized by reliable and meaningful measuring data, a robust set-up and an easy handling. Due to optimized system setups, our scattered light spectrometers develop additional individual solutions, for example for the measurement of pharmaceutical aerosols and for controlling and monitoring processes, also under difficult conditions. At the same time, the welas® measurement range has been extended considerably.
Inform yourself about these and further news from practice in this newsletter.

Leander Mölter
Managing Director Palas® GmbH

▶ IN THIS EDITION

Measurement of pharmaceutical aerosols with Inas

New Palas® product has been developed in close co-operation with scientists at the Pharmaceutical Institute of the Christian Albrecht University of Kiel

▶A study of the Pharmaceutical Institute of the Christian Albrecht University of Kiel shows that the Palas® Inas system which has been developed based on the white light aerosol spectrometer system welas® allows fast and reliable particle size distribution measurements of pharmaceutical aerosols.* According to the authors from the Department of Pharmaceutics & Biopharmaceutics, quantity determination of the particles is possible for the welas® system, in contrast to laser diffraction analysis. Furthermore, with the new light scattering spectrometer Inas, single actuations of medical nebulisers can be temporally analysed with high resolution due to the digital individual signal processing. This new Palas® product has been developed in close co-operation with the scientists at the Pharmaceutical Institute within the framework of a research project.

Why do pharmaceutical aerosols have to be measured?

In order to take effect or be absorbed locally in the lung, pharmaceutical aerosols must reach the respiratory tract. That is, however, structured in such a way that foreign particles are deposited as early as possible. It is therefore necessary for the pharmaceutical application that the aerosol particles are smaller than 5 µm explains Maren Kuhli, scientific assistant at the Pharmaceutical Institute. "In order to ensure stable aerosols within the quality control in the production of nebulisers and in the development of new formulations, the measurement of the particle size distribution is of great interest". It is necessary to generate the same flowrate for these measurements as required in the pharmacopoeia for impactors. According to EN 13544-1, 15 l/min are required for nebulisers. Isokinetic and representative sampling is a requirement for any measurement with optical particle counters.

Scattered light spectrometer Inas for the measurement of pharmaceutical inhalers

Suitable dilution unit developed

Until now, accepted methods for the characterisation of pharmaceutical aerosols have been the time-consuming cascade impaction as standard procedure as well as laser diffraction which has however to be validated with the cascade impaction for application in the quality control. It has now been investigated how pharmaceutical aerosols can also be measured with optical particle counters. By means of a welas® 2070 sensor aerosols from a jet nebuliser, a membrane nebuliser and an ultrasonic nebuliser were analysed. In order to avoid a measurement in coincidence at high particle concentrations the test aerosol is diluted in the measuring device. The difficulty here is that the particle size distribution must not change due to evaporation during the sampling of the diluted aerosol. This problem has been resolved with a variable dilution unit in the range of 0.2 up to 1.0 l/min and an additional pump. "In combination with this optimised new sampling and dilution system welas® is well-suited for the measurement of solutions and nanosuspensions"**, conclude the scientists. "Thereby a new, time-saving method in the quality control of pharmaceutical aerosols can be provided".

With Inas individual spray doses can be analysed temporally resolved

By the development of Inas Palas® now offers a system for the reliable and economic quality control and further development of pharmaceutical nebulisers. Inas allows the measurement of single particles in concentrations up to 10^7 P/cm³ in a particle size spectrum from 0.2 to 40 µm. Inas has new electronics for the digital individual signal analysis in the milliseconds' range and is supplemented by a software which corrects coincident signals according to Dr. Umhauer and Prof. Sachweh. Particle sizes and quantities can be determined at a temporal resolution of 10 ms. This digital extension offers highly interesting possibilities for observing the temporal modification of the particle quantities and the size distribution for example with a single spray burst.

Maren Kuhli and Prof. Dr. Hartwig Steckel, Pharmaceutical Institute of the Christian Albrecht University of Kiel

Literature

** Maren Kuhli, Maximilian Weiss, Hartwig Steckel: "A sampling and dilution system for droplet aerosols from medical nebulisers developed for use with an optical particle counter". Journal of Aerosol Science (2009), doi:10.1016/j.jaerosolsci.2009.02.007, in press*

*** Maren Kuhli, Maximilian Weiss, Hartwig Steckel: "Size Matters: a Method Comparison for Aqueous Drug Suspensions for Nebulization". Respiratory Drug Delivery Europe 2009, abstract accepted*

▶ PALAS® CUSTOMERS

C | A | U

Christian-Albrechts-Universität zu Kiel

▶Pharmaceutical Institute of the Christian Albrecht University of Kiel

The research fields of the Department Pharmaceutics & Biopharmaceutics are aerosols, semi-solid dosage forms, solid dosage forms, news technologies and microbiology/cell cultures.

A main topic in the field of the aerosol characterisation is the development of a new sampling system for the determination of the particle size distribution of pharmaceutical aerosols by means of a new optical aerosol measuring system.

Contact:

Prof. Dr. Hartwig Steckel
Grasweg 9a, 24118 Kiel, Germany
Phone +49 431 880-1334
Fax +49 431 880-1352
E-Mail: hsteckel@pharmazie.uni-kiel.de
http://www.uni-kiel.de/Pharmazie/technologie

Palas® launches new product generation

With optimized devices for the calibration and filter test technology as well as for the particle measurement technology, Palas® develops new fields of applications

welas® digital system
- digital individual signal processing

▶The advantages of the well-proven T-aperture technology and of the modular set-up have been combined with a digital individual signal processing which provides a coincidence correction. With the flexible and powerful new scattered light spectrometer system welas® digital, the particle concentration and the particle size can be determined with high classification accuracy, excellent size resolution and without border zone error. Sensors for various particle concentrations and special sensors provide highest flexibility. Measurements are possible in under and overpressure up to 10 bar, from -90°C up to +70°C and heated up to 250°C. Due to the light wave conductor technology also measurements under GMP conditions in places being difficult to access and explosive are possible.

- ▶**welas® digital 1000:** Measuring range from 0.12 to 40 µm, max. concentration $5 \cdot 10^5$ P/cm³
- ▶**welas® digital 2000:** Measuring range from 0.2 to 40 µm, max. concentration 10^6 P/cm³
- ▶**welas® digital 3000:** Quasi simultaneous measurements with two sensors. Measuring range from 0.2 to 40 µm, max. concentration 10^6 P/cm³

Various sensor types for different concentration ranges available.

New products: Promo, Inas, Fidas and MAG 3000

Promo – Scattered light spectrometer for process monitoring
- ▶Measuring range: 0.2 µm – 40 µm
- ▶Standardised interface
- ▶Stand alone operation
- ▶Quasi simultaneous particle measurement with Promo 3000

Promo

Inas - Scattered light spectrometer for the measurement of pharmaceutical inhalers
- ▶Digital individual signal analysis in the millisecond range
- ▶Measurement in concentrations of up to 10^7 P/cm³
- ▶Measuring range: 0.2 µm – 40 µm

Fidas - Scattered light spectrometer for environmental technology and fine dust measurement
- ▶Measuring range: 0.2 µm – 40 µm
- ▶Excellent particle size classification accuracy
- ▶Undiluted measurements in concentrations up to 10^6 P/cm³

Fidas

MAG 3000 – Monodisperse aerosol generator for the generation of spherical and uncharged particles
- ▶Particle size from approx. 0.2 to 8 µm for DEHS (other materials on request)
- ▶No drying system, no silicagel
- ▶Number concentration: $C_{N\,max}$ 10^6 P/cm³
- ▶Volume flow: 3.5 – 4.5 l/min
- ▶Quick change of particle size up to factor 2.5

MAG 3000

Detailed product information on www.palas.de

MFP filter test systems for HEPA/ULPA

New: MFP 1000 HEPA
with welas® digital 1000
New: MFP 2100 HEPA/ULPA
with LAS-X II or HSLAS II

MFP 1000 HEPA

▶The well-proven MFP filter test system for flat filter media and very small filters analyses reliably the aerosol concentration and the particle size. This due to the fact that is has been extended with the new scattered light spectrometer system welas® digital 1000 which can now measure up to approx. 120 nm because of the new digital individual signal processing. This ensures an unambiguous determination of the fractional separation efficiency and the MPPS range for HEPA filters. As alternative, also the scattered light spectrometers LAS-X II or HSLAS II for HEPA/ULPA filter classes can be installed. An additional advantage are the movable dilution cascades with the factors 10, 100, 1,000 and 10,000. Due to them the test rig can be adapted shortly from salt aerosols to DEHS aerosols without cleaning effort. All single components are clearly characterized. The flexible Palas® filter test software PMAS in connection with a to a large extend automated test process and an automated volume flow control by mass flow controllers ensure a high reliability of the measuring results.
An integrated drying system supersedes the use of silicagel.

Apart from the mentioned media cabine air filters according to ISO 11155-1, room air filters according to EN779/ASHRAE 52.2 as well as filters according to CEN EN 143 and other standards in different versions can be tested.

Technical parameters
- ▶Volume flow 0.54 – 16 m³/h in pressure mode
- ▶Inflow velocity: 1.5-40 cm/s (others on request)
- ▶Particle measuring ranges: 120 – 2000 nm, 200 – 9000 nm, 0.25 – 17 µm, 0.6 – 40 µm (welas® digital 1000)
  90 nm – 7500 nm (LAS-X II),
  60 nm – 1000 nm (HSLAS II)

Palas® has a new internet presence

▶Having revised the corporate design and the corporate logo the web presence has now also been redesigned graphically and structured more clearly.

Visitors can quickly find the respective solutions and products which are of interest for their branch via an overview of the single application fields on www.palas.de. With only a few mouse clicks you can surf through the product lines and also inform yourself about the services. On the site the regularly updated schedule of the Palas® seminars and fair presences as well as further useful information on the company are also to be found.

On the website customers, partners and interested people can download product data sheets, all editions of the newsletter Palas® Particular as well as the Palas® company brochure fast and flexibly.

Have a look at www.palas.de!

The new internet presence on www.palas.de

Jeanette Lange – The new face in the secretary's office

▶Since 1 January 2009, our new Palas® assistant Jeanette Lange has being responsible for the secretary's office of the Managing Director. The 26 years old European Secretary speaks English, French and Spanish. She has been appealed by the diversity of responsibilities, as she reports "from the trade organization to the support of the sales department". The new assistant who has her origin in the Swabian Donzdorf moved to Karlsruhe due to her training at the well-known Walter-Eucken-Schule. In her free time Jeanette Lange likes dancing and going to the cinema with her friends.

▶ PALAS® AGENDA

Palas® will be represented at the following events and exhibitions (excerpt). We are looking forward to meeting you!

▶**AFS American Filtration Society**
04.05. – 07.05.2009
Minneapolis, USA

▶**ACHEMA - Hall 6.1, booth B21**
11.05. – 15.05.2009
Frankfurt, Germany

▶**Automotive Testing Expo - Hall 1/1464**
16.06. – 18.06.2009
Stuttgart, Germany

▶**ETH Zürich**
22.06. – 24.06.2009
Zurich, Switzerland

▶**EAC**
06.09. - 11.09.2009
Karlsruhe, Germany

▶**Gala**
08.09. – 10.09.2009
Erlangen, Germany

▶**23. Palas® ATS Aerosol-Technology-Seminar**
13.09. - 15.09.2009
Karlsruhe, Germany

▶**Filtech - Booth F6 in the Foyer**
13.10. - 15.10.2009
Wiesbaden, Germany

▶**13. Convention Clean Room Technology**
26.10. - 27.10.2009
Frankfurt, Germany

Palas® Training Courses

▶**"Aerosol Technology for the Clean Room"(in German)**
10.11.2009, Karlsruhe, Germany

▶**" Particle Measurement related to Filter Testing" (in German)**
11.11.2009, Karlsruhe, Germany

▶**"Particle Measurement related to Filter Testing" (in English)**
12.11.2009, Karlsruhe, Germany

▶ PALAS® SERVICE

Calibration service

▶Users can let calibrate their aerosol generators, dilution systems and aerosol spectrometers reliably and unambiguously at Palas®. A test rig allows the characterizations of the single components in a non-competitively wide spectrum. Devices can be tested in detail with most different powders, salt particles and droplets and the device characteristics can be determined at different operational conditions and settings. With the MAG 3000 now also the transfer function of sampling and dilution systems as well as of aerosol spectrometers and particle counters can be determined depending on the particle size. All commercial aerosol generators, dilution systems, particle counters and aerosol spectrometers can be calibrated.

For further questions and information please contact **Dipl.-Ing. Martin Schmidt**, schmidt@palas.de.

▶ PALAS® CONTACT

Palas® GmbH
Greschbachstr. 3B
76229 Karlsruhe , Germany
Phone: +49 721 96213-0
Fax: +49 721 96213-33
E-Mail: mail@palas.de
www.palas.de

Editor
Nina Heim

Words and Layout
Andreas Mauritz | Public Relations

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