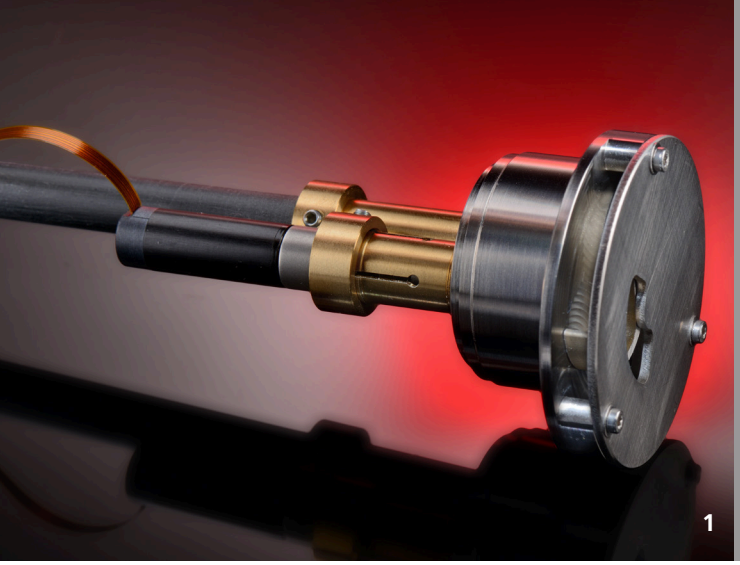

Subject to alterations in specifications and other technical information. 11/2021.

MINIATURIZED PROBE HEAD FOR INLINE PARTICLE ANALYTICS

Technology

In many chemical processes, particle sizes in the range from a few nanometers to a few micrometers play an important role and have a decisive influence on product properties. Using a new type of probe head for »in-situ sampling«, particle sizes can now also be recorded inline in ongoing processes with the aid of dynamic laser light scattering (DLS). The dynamic light scattering is based on an optical measurement of the intrinsic movement of particles in liquids (Brownian molecular movement), so the measuring method cannot be used in actively mixed media. With the help of a patented probe head with an impeller, a small sample volume is separated from the surrounding, actively mixed liquid. A DLS measurement is carried out using a fiber optic backscatter probe. The possible concentration range for the measurement process is limited by the occurrence of multiple scattered photons. Since, in contrast to offline measurements, no sample dilution is possible, a special procedure for the elimination of frequently scattered photons is used to analyze suspensions with high particle concentrations. With the aid of a cross-correlation of the signals from two identical scattering experiments, signal components that have been scattered more than once can be eliminated.

1 Inline Probehead.

2 CC-DLS Probe.

Method

For the cross-correlation measurement method, it is crucial that both scattering experiments take place in the same sample volume. For this, an excellent geometric overlap must be achieved between the two focused excitation lasers. To ensure this even without adjustment options, a component for the uptake of optical components was manufactured using the particularly precise SLE technology (Selective Laser Etching). Receiving openings for a total of four fibers and four collimation lenses were made in a quartz block. The two excitation and detection beam paths can be focused precisely in one point.

Applications

Nanoparticles play an important role in a wide range of chemical, pharmacological and biotechnological processes. Dispersion processes are particularly important from a technical point of view. Examples of fields of application are the grinding of crystalline pharmacological active ingredients, the production of inks from color pigments and the production of nanoparticulate fine chemicals, e. g. for catalysts or batteries.

Specifications

Laser wavelength	785 nm
Particle sizes	1 nm to 6 µm
Concentrations	up to 40 % (material specific)
Duration of measurement	typically between a few seconds and one minute

Contact

- Dr. Christoph Janzen, Telephone +49 241 8906-8003
  christoph.janzen@ilt.fraunhofer.de
- Dr. Achim Lenenbach, Telephone +49 241 8906-124
  achim.lenenbach@ilt.fraunhofer.de

Fraunhofer Institute for Laser Technology ILT, www.ilt.fraunhofer.de
DQS certified by DIN EN ISO 9001, Reg.-No.: DE-69572-01