



MINIATURIZED SAMPLE HEAD FOR INLINE PARTICLE ANALYSIS

Task

In many chemical processes, particle sizes in the range of a few nanometers to a few micrometers play a decisive role and influence product properties significantly. Using a novel sampling head for »in-situ sampling«, Fraunhofer ILT can now measure particle sizes in-line during running processes by using dynamic light scattering (DLS).

Method

Dynamic light scattering is based on an optical measurement of the diffusive motion of particles in liquids (Brownian molecular motion); for this reason, this measurement method cannot be used in actively mixed media. By means of a sample head with an impeller, a small sample volume is separated from the surrounding actively mixed liquid, and a DLS measurement is carried out with a fiber-optic back-scatter probe. So that the method can be used in applications with limited space requirements, the sample head has been miniaturized: the probe now has a diameter of only 10 mm. All electrical components (motor, laser, detector) are located outside the sample head, the rotary movement is transmitted via a flexible shaft.

Results

The new measuring head was developed in cooperation with RWTH Aachen University (Collaborative Research Center 985 – Functional Microgels and Microgel Systems). The successful use of the sample head for in-line tracking of a polymerization reaction has been published (Measurement, 80 (2016), 92-98).

Applications

Applications of inline DLS measurement technology can be found in all processes in which particle sizes between a few nanometers and a few micrometers have to be monitored in-line in a single process and measured without taking a sample. Examples are the monitoring of chemical polymerization reactions, the production of paints and lacquer, processes in the food industry, as well as various grinding and dispersing processes.

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1 *Miniaturized measuring head
for inline DLS measurements.*