OPTICAL INLINE PARTICLE ANALYSIS FOR MONITORING DISPERSION PROCESSES IN PRODUCTION

Task

For monitoring dispersion processes, Fraunhofer ILT is developing new tools for optical inline particle analysis in cooperation with international partners from industry and research. Their focus is on monitoring production processes in the pharmaceutical, dyestuffs and fine chemicals industries. Based on the needs of users, the partners are developing laser measurement processes for characterizing the size distribution and chemical composition of dispersions and testing them in industrial applications.

Method

Dynamic light scattering (DLS) is a suitable method for analyzing nanoparticles. So that the process can work inline, for example in a chemical reactor, Fraunhofer uses a probe equipped with an inline probe head to carry out the optical measurement. This probe head isolates a small amount of a sample so that undisturbed diffusion can be observed. The DLS method is based on the time-resolved detection of singly scattered photons from a small volume (a few picoliters), which roughly corresponds to the laser focus. So that the method can be used for high particle concentrations, multiple scattered photons have to be suppressed, since they distort the measured value. This is achieved by cross-correlating two identical scattering experiments. For this purpose, miniaturized optical assemblies with two excitation and two detection channels each are integrated into an immersion probe.

Results

Fraunhofer ILT set up and tested the inline probe head with integrated measuring probe on mono- and polydisperse solutions in the laboratory. For the cross-correlation measurement process, both scattering experiments have to take place in the same sample volume. This is achieved without adjustment by using a high-precision glass component to accommodate four fibers and collimating lenses. This component was manufactured by selective laser-induced etching (SLE).

Applications

Nanoparticles play an important role in a wide variety of chemical, pharmacological and biotechnological processes. In the present PAT4Nano project, the focus is primarily on dispersion processes. Applications can be found in the grinding of crystalline pharmacological active ingredients, the production of ink from color pigments, and the production of nanoparticulate fine chemicals, e.g. for catalysts or batteries.

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Contact

Dr. Christoph Janzen, Ext: -8003
christoph.janzen@ilt.fraunhofer.de

Dr. Achim Lenenbach, Ext: -124
achim.lenenbach@ilt.fraunhofer.de

2 Inline probe head.

3 Quartz block as optics holder with inserted fiber ferrule.