DETERMINING THE SPEED OF DISPERSED PARTICLES IN A FLOWING SOLUTION

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BACKGROUND

The Institute of Complex Systems at Forschungszentrum Jülich developed a method for determining the velocity of dispersed particles in a flowing solution in the immediate vicinity of a solid body wall. The technology allows characterizing the flow velocity profile of suspensions in the ultimate vicinity of the surface of a transparent solid (e.g. glass). The speed of suspended particles and local shear rates are determined by analyzing the recorded temporal autocorrelation function g_m(t) of the intensity scattered by particles moving in an evanescent wave, which is obtained by total reflection of a laser beam at the surface. The evanescent wave has a penetration depth of the order of hundred nanometers making the measurement sensitive to events which take place at separations from the surface of the same scale.

A prototype of the described Technology has been tested extensively and successfully with standard materials. However, further development and miniaturization of the prototype is necessary to validate this technology for an applied context.

PROBLEM

The optical detection based on total internal reflection and the associated evanescent wave provide unprecedented microscopic resolution. However, currently a quantitative data interpretation is limited to systems in which the viscosity is high enough to make Brownian motion negligible.

SOLUTION

The high-precision technology enables easy measurement of particle velocity along a surface with a resolution normal to the surface in the range of several tens of nanometers and is easily implementable in a variety of different sample environments. Moreover, the technology is non-invasive and can be incorporated into a (production-) process to deliver data continuously.

Forschungszentrum Jülich GmbH

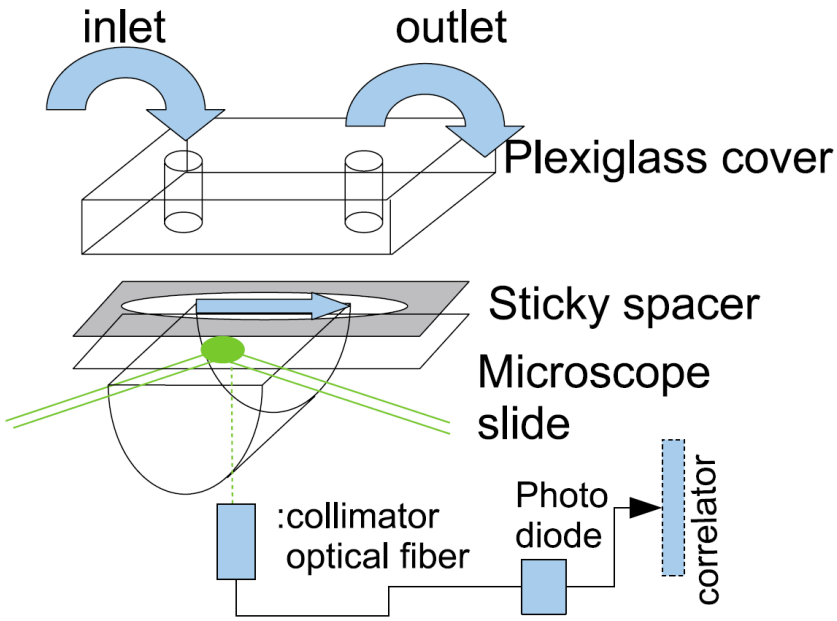
Daniel Braun
+49 2461/61-85219
d.braun@fz-juelich.de
www.fz-juelich.de

DEVELOPMENT STATUS

Prototype

CATEGORIES

//Instrumentation and controls engineering technology //Physical sciences //Optics, photonics and laser technology //Sensor systems technology and measuring instruments //Materials science and engineering //Nanotechnology //Surface engineering //Smart materials



sketch of the first set up for proof of principle

SCOPE OF APPLICATION

Due to its resolution range of 10-100 nanometers, the technology can potentially be used in the context of microfluidic systems (Lab-on-a-Chip).

PUBLICATIONS & LINKS

B. Loppinet, J.K.G. Dhont. P. R. Lang Eur. Phys. J. E (2012) 35: 62