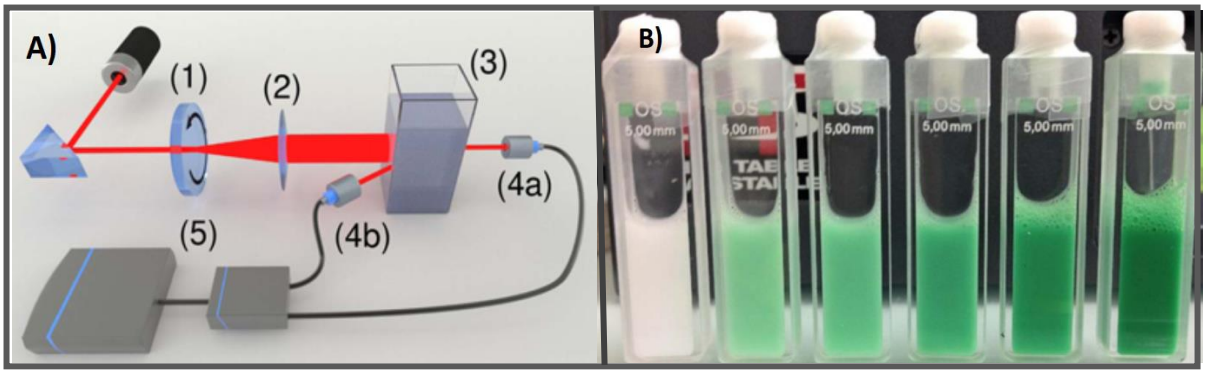
Automated Determination of Turbidity and Absorption for DWS

Diffusing Wave Spectroscopy (DWS) is a revolutionary optical technique that gives access to the detailed microrheology of many fluid systems such as gels, foams or nanofluids. This powerful technique can be applied directly to turbid (highly scattering) samples and with only a simple sample preparation step to nearly any fluid sample. Thanks to the automated calibration procedure developed by LSI, that is all you need to characterize your sample faster and more precise than ever before.

Why is it now so much easier? In the past the optical turbidity and the absorption of the sample needed to be known to harness the full potential of DWS. These parameters had to be obtained by an additional measurement with a calibration reference. This non-trivial procedure however significantly increases the overall measurement time and is prone to result in handling errors. Moreover, this calibration assumes negligible optical absorption (figure B), which is not given in many practical cases, thus resulting in systematic errors. With the latest version of the DWS RheoLab III, this annoying limitation is finally an issue of the past. It is the only instrument which performs an automated determination of the turbidity and absorption and therefore omits the previously needed calibration step.

How does it work? The automated calibration is based on a measurement of the transmitted and backscattered laser intensity (see figure A) and uses a recently published algorithm[1] developed by LS Instruments that considers the diffusive transport of light and the scattering geometry. It allows accurate determination of the turbidity (characterized by the transport mean free path l^*) and the absorption (characterized by the absorption length l_a) of the sample. The procedure is automatically executed before the actual DWS measurement.

How do you get it? Starting with release version 3.3, the RheoLab III comes with the automated determination of turbidity and absorption. This feature is also available as an upgrade for older versions, please contact LS Instruments for more details.



A – Set-up of the automated determination of l* and absorption. Both, the transmission (4a) and the backscattering (4b) intensity of the sample (3) is measured. In order to allow measurements on non-ergodic samples, the incoming laser beam is scrambled by a rotating ground glass (1).

B – Examples of colloidal samples with different optical absorptions in cuvettes of 5mm optical path length. The absorption is due to a green food dye with concentrations of 0 (left) to 8 vol% (right).

[1] Zhang et al., Korea-Australia Rheology Journal, 29(4), 241-247 (2017)

LS Instruments AG
Switzerland
www.lsinstruments.ch