Thermo Scientific HAAKE RheoScope module: image acquisition at (very) high shear rates using a stroboscope light source

Key words
Thermo Scientific HAAKE MARS, Thermo Scientific HAAKE RheoScope module, Stroboscope light source, Data acquisition at high shear rates, Emulsions, dispersions

The optionally available stroboscope light source extends the capabilities of the HAAKE RheoScope module, facilitating on the one hand an investigation of rheological phenomena on a structural level also at (very) high shear rates and providing on the other hand an improvement of the quality of the microscopic images at lower shear rates due to a shorter exposure time and a higher light intensity.

Thanks to the stroboscope light source, e.g. the behavior of paints and inks during the coating process can be investigated with the RheoScope or the coalescence of emulsion droplets under high shear rates. Shear-induced orientation and deformation in a sample as well as the structural disaggregation and recovery under defined temperature and shear conditions are further examples.

Instead of using a cold light source, a stroboscope (model BVS-II Wotan, Polytech GmbH) can be connected to the RheoScope module using the same light guard. This modification can be made done by the user within seconds without any tools. The stroboscope light source is equipped with a Xenon flash lamp and has a maximum flash frequency of 200 Hz. In order to synchronize the microscopic data acquisition with the flash light of the stroboscope, only the integration time of the camera in the HAAKE RheoWin software needs to be adapted.

High quality images can be obtained up to a shear rate of 44 000 s^{-1} using the HAAKE RheoScope camera in combination with the stroboscope light source. Based on experience and depending on the individual sample, images up to a shear rate of 2000 s^{-1} can be taken with a cold light source. This means, that the use of a stroboscope light source with the HAAKE RheoScope module extends the measuring range by factor of 20.

In Fig. 1 microscopic images of a dispersion of mineral oil in silicone oil are depicted at three different shear rates

Thermo Scientific RheoScope module

using a cold light source (Fig. 1a - c) and a stroboscope (Fig 1e - f). A plate/plate measuring geometry with a diameter of 35 mm and a polished surface using a measuring gap of 50 µm was used. Significant differences are already visible at a shear rate of 1290 s^{-1} (Fig. 1b and 1e): Images taken using a stroboscope (with a flash frequency of 20 Hz) have a much higher quality than those obtained with a cold light source.

Fig. 2 shows, that high quality images up to a shear rate of 44000 s^{-1} can be taken using a stroboscope light source.

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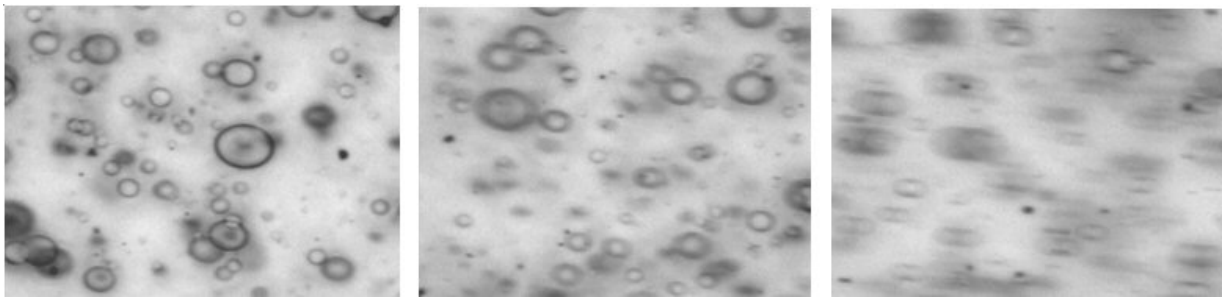

Fig. 1a - c: Images taken using a cold light source at different shear rates: 630 s^{-1} (1a), 1290 s^{-1} (1b) and 2520 s^{-1} (1c)

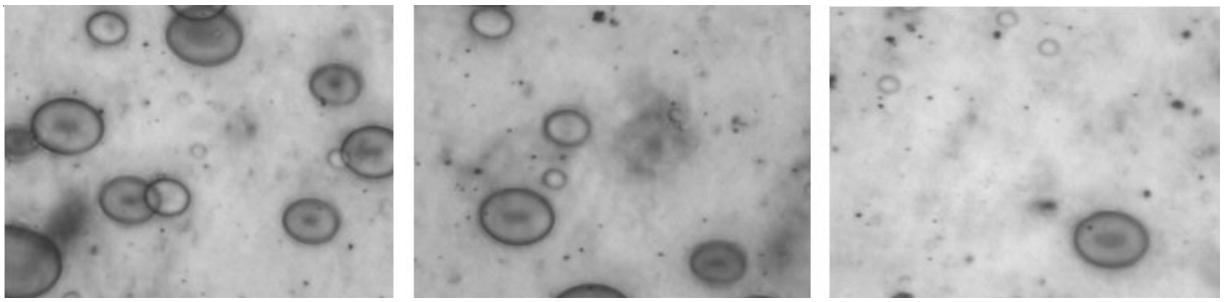

Fig. 1d - f: Images taken using a stroboscope light source at different shear rates: 630 s^{-1} (1d), 1290 s^{-1} (1e) and 2520 s^{-1} (1f)

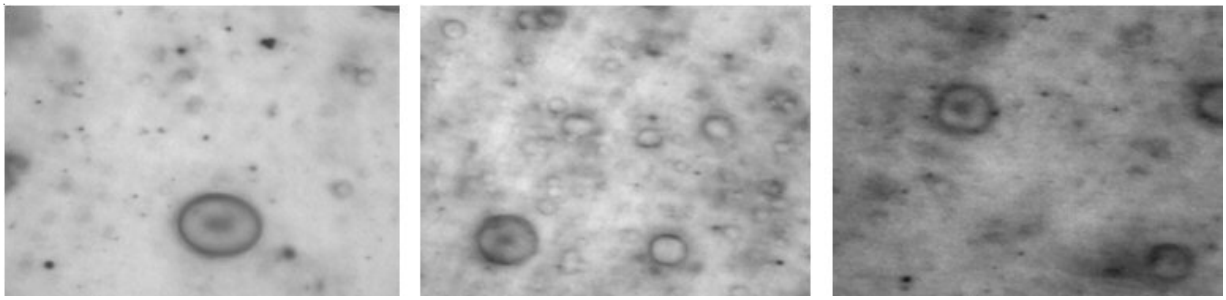

Fig. 2a - c: Images taken using a stroboscope light source at higher shear rates: 5670 s^{-1} (2a), 12600 s^{-1} (2b) and 44000 s^{-1} (2c)

Order information

222-2050 Optional accessory for HAAKE RheoScope module: Stroboscope light source with Xenon flash lamp with maximum flash frequency of 200 Hz (85 V – 265 V / 50 Hz – 60 Hz)

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Material Characterization

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