

## RheoAdaptive Control

### Ultra low rotational speed control and fast response times

Most (very) low shear rate measurements are performed in Controlled Stress (CS) mode, because most real live applications in which (very) low shear rates are important are driven by a constant stress.

Examples are sagging, sedimentation, and phase separation all phenomena that are driven by a constant force i.e. gravitation. These processes are simulated in a rheometer by applying a constant stress.

However, under certain circumstances applying a (very) low shear-rate in Controlled Rate (CR) mode might be required, for example when the flow of material which is slowly stirred in a large container needs to be simulated (measured).

The measurement data below shows that the Thermo Scientific HAAKE MARS is very capable of applying very low rotational speed values by using the RheoAdaptive rotational speed control loop, which can be activated by an optional software module for Thermo Scientific HAAKE RheoWin 4.

#### Key-words

- Viscosity measurement
- RheoAdaptive Controlled Rate (CR) control loop
- (Ultra) low shear rates
- Thermo Scientific HAAKE MARS
- Thermo Scientific HAAKE RheoStress 6000

#### Instrument

- Thermo Scientific HAAKE MARS
- UTC Peltier
- C35/1°Ti

#### Sample

- Viscoelastic sample (cosmetic cream)

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#### Reliable data down to $10^{-9}$ rad/s

The graph below shows the results of an experiment on a cosmetic cream in which the rotational speed was stepwise increased from  $10^{-9}$  rad/s to  $10^1$  rad/s. Even at a very low rotational speed the response time is clearly  $< 100$  s, whereas for rotational speeds of  $10^{-6}$  rad/s and higher response times shorter than 10 ms can be achieved. It should be emphasized that these are measurements on a cosmetic cream, that is a “difficult” sample which shows a yield stress and properties that change dramatically as a function of the shear rate.

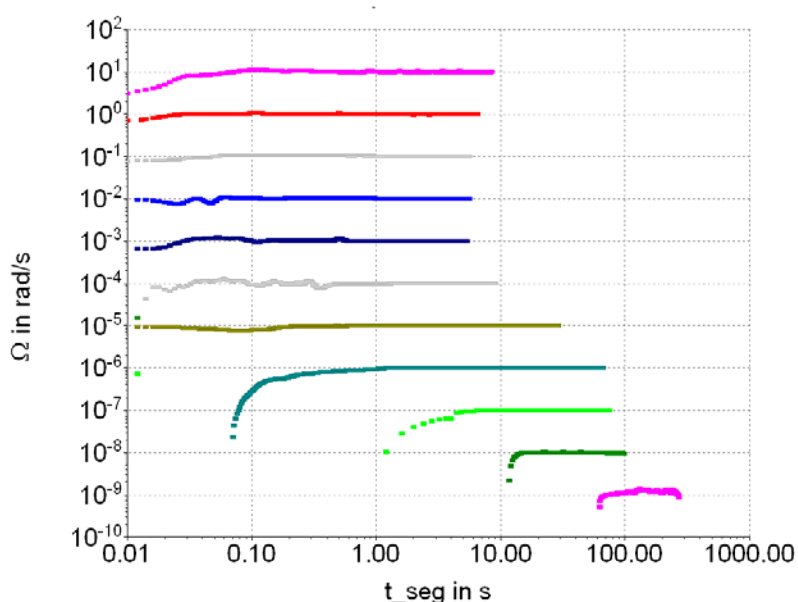


Fig. 1 Performance of the “RheoAdaptive Control” over a 10 decade rotational speed range