TA Instruments, 159 Lukens Drive, New Castle, DE 19720
Telephone: (302) 427-4000 • Fax: (302) 427-4001
E-mail: info@tainstruments.com
www.tainstruments.com

Orthogonal Superposition

A NEW DIMENSION IN DUAL HEAD RHEOLOGICAL TESTING

TA Instruments introduces a new dimension in rheological testing exclusive to the ARES-G2. Simultaneous deformation in the angular and axial directions unlocks all new capabilities for probing non-linear and anisotropic behavior of complex fluids. This new testing capability utilizes the unique capabilities of the ARES-G2 FRT to apply oscillation in the axial direction, orthogonal to the direction of angular shear.

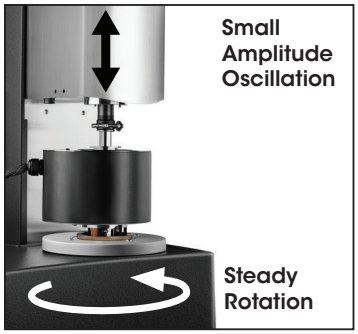
Features and Benefits

- Exclusive to the ARES-G2 rheometer
- Double gap concentric cylinder
- OSP and 2D-SAOS experiments fully programmable from TRIOS Software
- Simultaneous measurements in two directions
- Advanced Peltier System temperature control

Orthogonal Superposition (OSP)

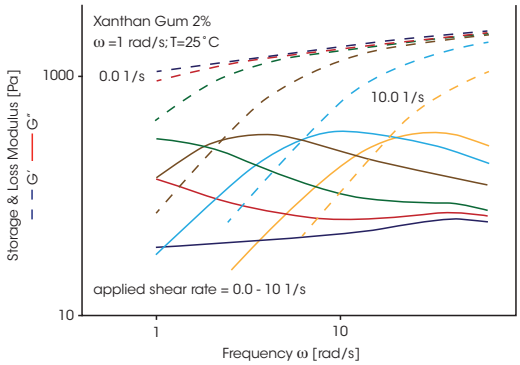
A New Test of Non-Linear Viscoelasticity

Orthogonal Superposition provides an additional powerful method to probe non-linear viscoelasticity. Steady shearing deformation in the angular direction is coupled with an oscillatory deformation applied by the ARES-G2 FRT in the axial direction. Steady state properties in the flow direction and dynamic properties orthogonal to flow are measured. This flow is well-controlled and the viscoelastic response is easily interpreted.



Xanthan Gum Solution

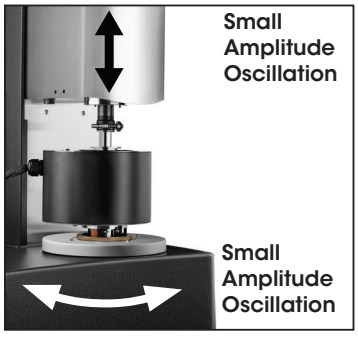
In this example of orthogonal superposition a 2% Xantham Gum solution in water is subjected to steady shear from 0 s^{-1} to 10 s^{-1}. A frequency sweep is performed simultaneously, revealing the dynamic moduli orthogonal to the direction of steady shear. The demonstrates that the time scale of terminal flow – indicated by the crossover frequency – moves to shorter time scales as the shear rate increases.



2-Dimension Small Amplitude Oscillatory Shear (2D-SAOS)

A selective probe of anisotropy

2D-SAOS measures linear viscoelasticity with directional selectivity. This is especially valuable for understanding anisotropy in complex fluids. Simultaneous oscillatory deformations in the angular and axial directions produce either: linear oscillations at a controlled angle, or local rotational flows, which provide a complete understanding of anisotropy in a single oscillation period.



Highly Filled Dental Adhesive Paste

2D-SAOS reveals anisotropy in a fluid, which may be induced by sample shear history. This highly filled dental adhesive paste underwent pronounced alignment as the result of previous shear flow. The sample was subjected to an isotropic two dimensional small amplitude deformation. The resulting stress is clearly anisotropic, revealing the anisotropy of the fluid. This technique can be particularly helpful when exploring thixotropic behavior in filled systems.