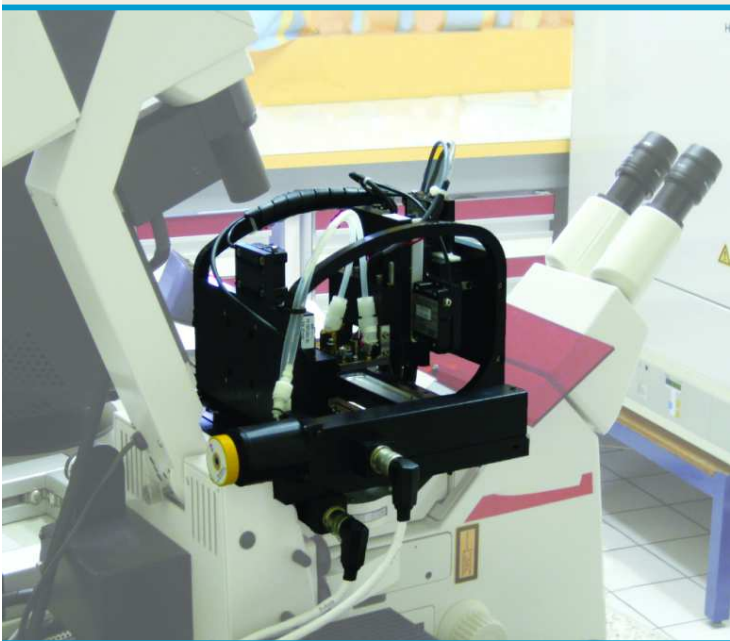


RHEOPTICAD: A THERMO-MECHANICAL RHEO-OPTICAL DEVICE



Description

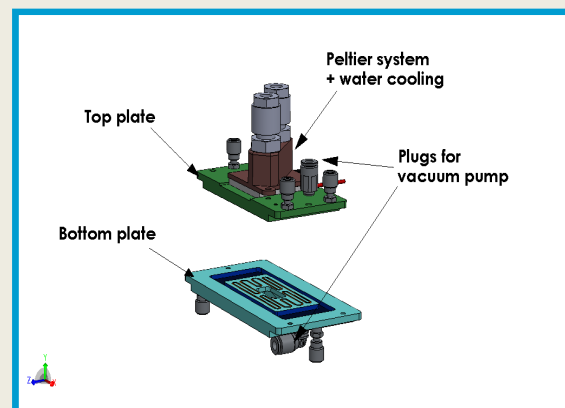
Developed in collaboration between AgroParisTech, INRA and CAD Instruments, **RheOptiCAD®** is high standard device for imaging complex systems, from liquids to solids, under thermo-mechanical treatments.

Uniaxial shear is performed by translation of two parallel plates and temperature is controlled using a Peltier module coupled to a water cooling system.

RheOptiCAD® is adaptable to all optical or confocal inverted microscopes, and presents a simple, fast and reproducible way of sampling, not depending on commercial microscopy glasses.

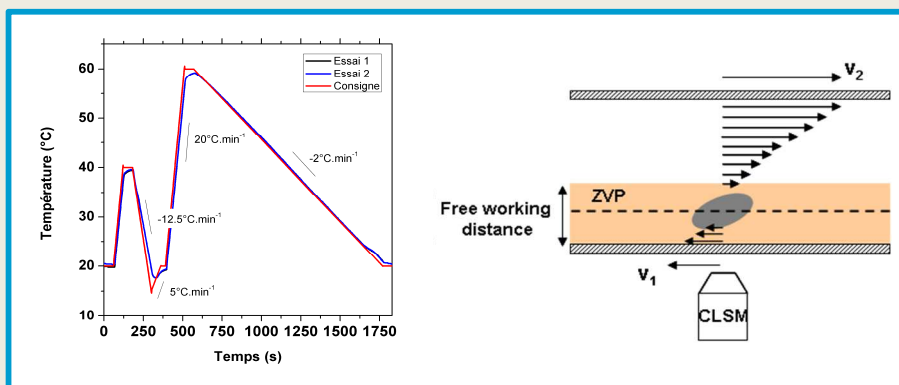
Features and Benefits

- > Large gap range for an easy and adaptable sampling
- > Perfect planarity and parallelism of shearing plates
- > Suction system for microscopy glasses hold
- > Observation based on ZVP principle
- > Motion: linear, strain jump or oscillation
- > Electric torque measurement for force estimation
- > Controlled heating and cooling rate with Peltier system
- > Computer controlled through Ethernet plug
- > Data recording
- > Designed for commercial microscopy glass
- > Thermo-mechanical characteristics similar to rheological devices



Specifications

- > Gap width: 0 - 5 mm
- > Strain: 0.02 - 320
- > Shear: 0.01 - 400 s⁻¹
- > Load Force: 0 - 16 N
- > Frequency: 0.1 - 10 Hz
- > Observation zone: ~ 140 mm²
- > Temperature
 - range: 10 - 80°C
 - rates: 0 - 10°C.min⁻¹
- > Shear cell geometry:
 - cube 20 cm side
 - weight ~ 5 kg

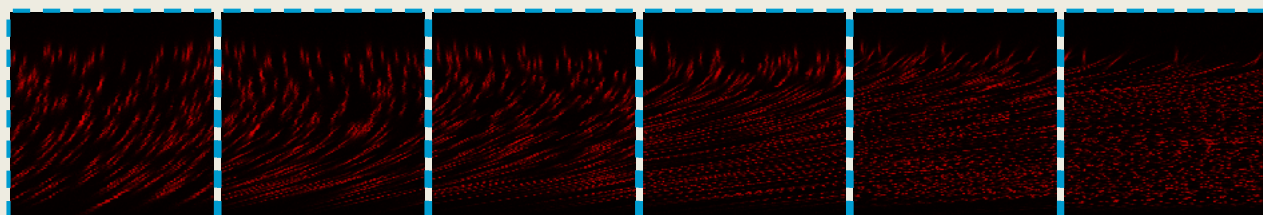
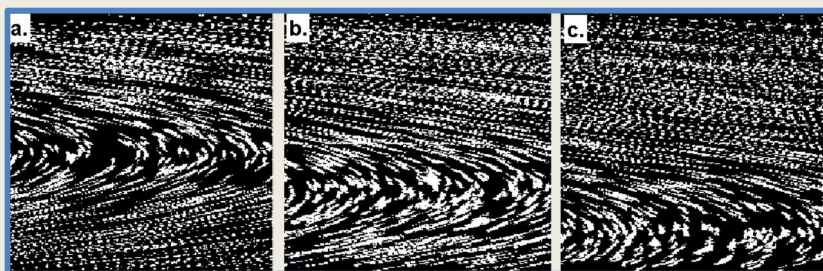


RHEOPTICAD: A THERMO-MECHANICAL RHEO-OPTICAL DEVICE

Applications

► Polymer science

- > Crystallization
- > Induced orientation
- > Retraction – relaxation process
- > Interface behavior
- > Flow imaging



Shear rate (s^{-1})

- > Gelation kinetic and dynamic
- > Sol-Gel transition, state changes

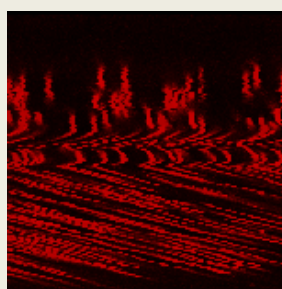
Cooling under shearing

$T = 45^{\circ}C$

$- 5^{\circ}C.min^{-1}$

$T = 20^{\circ}C$

300 μm



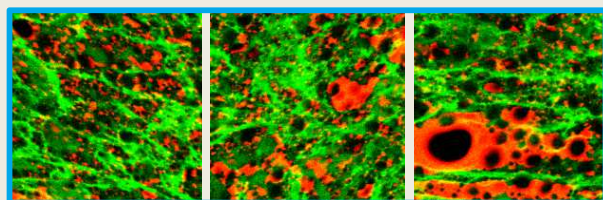
Top plate

Gelation line

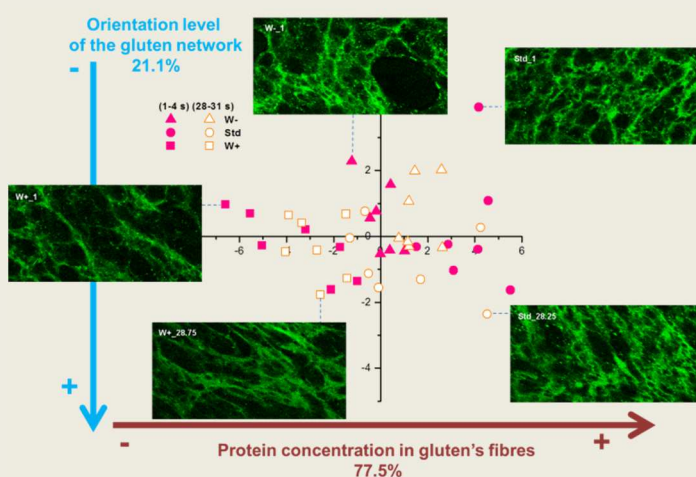
Bottom plate

► Bread dough

- > Gluten network orientation under shear
- > Air bubble growing during fermentation
- > Strain hardening versus formulation
- > Lipids motion and localization at interface
- > Co-localization zone
- > Air bubble deformation and relaxation



Shear rate (s^{-1})



References

- Boitte J-B., Vizcaino C., Benyahia L., Herry J-M., Michon C. and Hayert M., (2013). A novel rheo-optical device for studying complex fluids in a double shear plate geometry. *Review of Scientific Instrument*, **84**, (1), 13709
- Boitte J-B, Hayert M. and Michon C. (2013). Observation of wheat flour doughs under mechanical treatment using confocal microscopy and classification of their microstructures. *Journal of Cereal Science*, (in press)