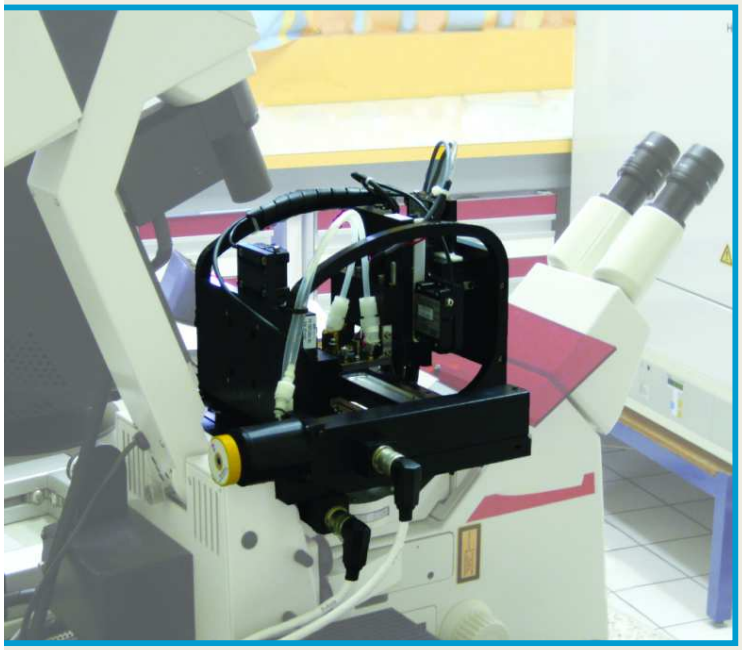
RHEOPTICAD: A THERMO-MECHANICAL RHEO-OPTICAL DEVICE



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.

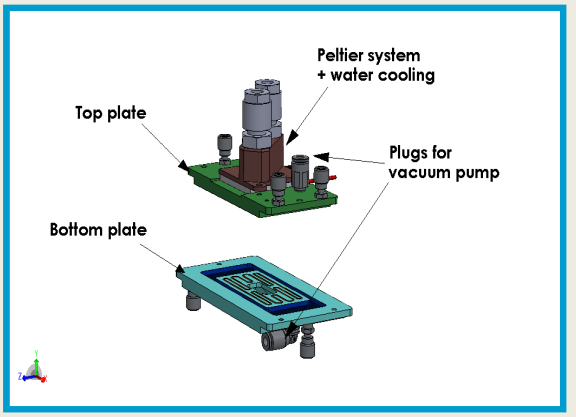
Uniaxial shear is performed by translation of two parallel plates and temperature is controlled using a Peltier module coupled to a water cooling system.

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

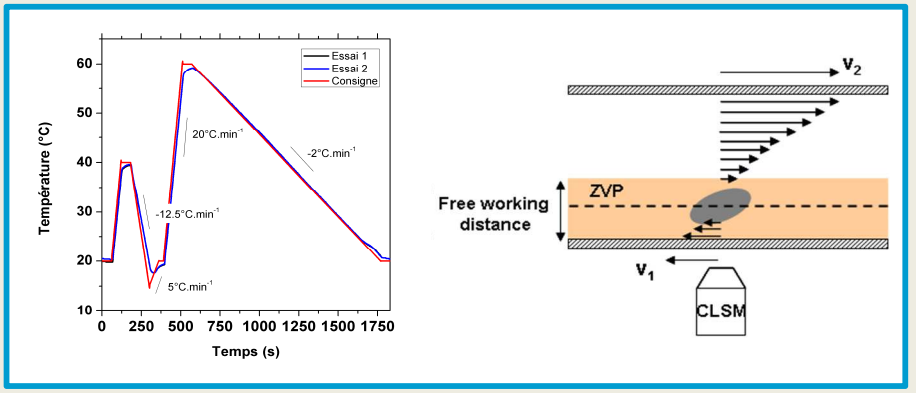
- Large gap range for an easy and adaptable sampling
- Perfect planarity and parallelism of shearing plates
- Suction system for microscopy glasses hold
- Observation based on ZVP principle
- Motion: linear, strain jump or oscillation
- Electric torque measurement for force estimation
- Controlled heating 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 mm^2
- Temperature
  - range: 10 - 80°C
  - rates: 0 - 10°C.min^{-1}
- Shear cell geometry:
  - cube 20 cm side
  - weight ~ 5 kg



Hameau de Saint Hubert – 10, rue de la Haie aux Vaches – F-78690 Les Essarts-le-Roi – France
Tel: +33 1 34 84 93 94 – Fax: +33 1 34 84 66 44 // www.cad-inst.com // cad@cad-inst.com

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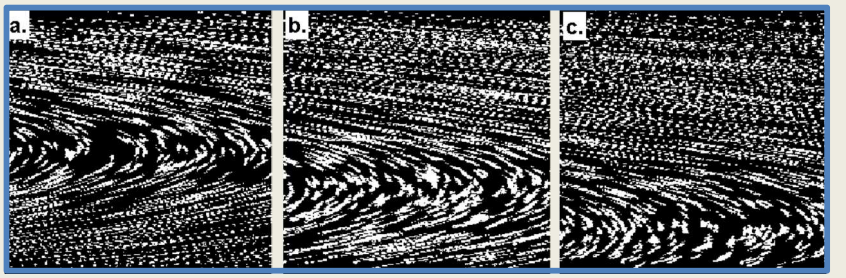
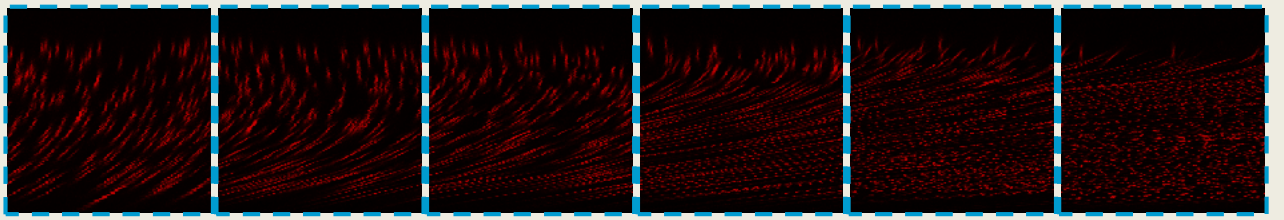
Applications

Polymer science

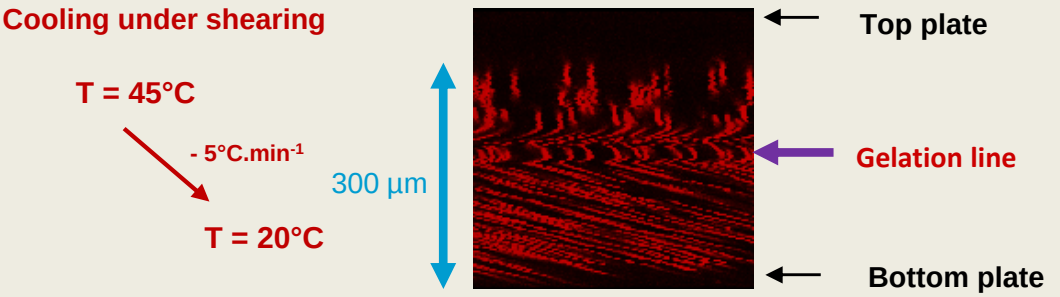
- Crystallization
- Induced orientation
- Retraction – relaxation process
- Interface behavior
- Flow imaging





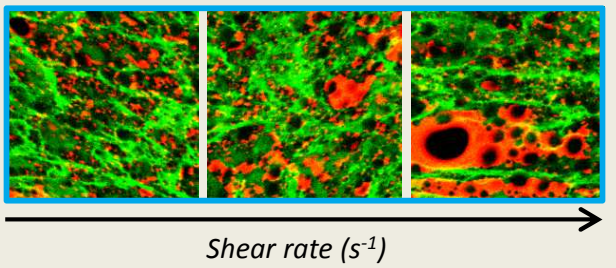
Shear rate (s^{-1})

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

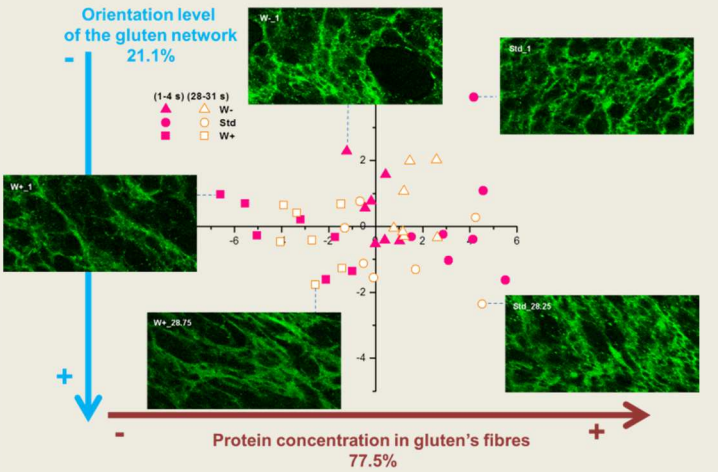


Bread dough

- 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)

CAD Instruments

Hameau de Saint Hubert – 10, rue de la Haie aux Vaches – F-78690 Les Essarts-le-Roi – France
Tel: +33 1 34 84 93 94 – Fax: +33 1 34 84 66 44 // www.cad-inst.com // cad@cad-inst.com