An aqueous foam is potentially an interesting template for conceiving responsive materials; in particular, this is due to the hierarchical organization at different lengthscales and to the fact that tiny effects at interfaces can have strong macroscopic impact.

We report here some results on the development of a thermo-sensitive foam based on the use of a thermo-sensitive polymer (Poly(N-isopropylacrylamide, PNIPAM), whose behavior at the liquid-air-interface and in bulk depends on temperature.

We show how both dilational and shear interfacial moduli depend on temperature and the behavior of a film and 3D foam made from this solution. Then we discuss the effect of an addition of surfactants (SDS) on the properties at the different lengthscales.

Poly(N-isopropylacrylamide)
A thermo-sensitive polymer
Turbid solution for T>33°C (LCST)
Transition good-bad solvent when increasing temperature
Reversibility
Concentration $C_P=10g.L^{-1}$

PNIPAM

Viscoelasticity negligible. The presence of SDS annihilates the thermosensitivity of PNIPAM interfaces.

Films are more stable than pure PNIPAM films. The effect of temperature could be observed but depends on $C_{SDS}$ and $C_P$.

Foilms are unstable.

Conclusion and Outlooks
PNIPAM (thermosensitive polymer) striking behavior at the interface lengthscale.
- low temperature : liquid interface
- After a good/bad solvent transition (33°C) : viscoelastic

Thermo-reactive interfaces ! Viscoelasticity tunable with temperature.
- Fast coalescence of the PNIPAM foam at both high and low temperatures : Addition of surfactant is necessary.

PNIPAM + SDS (surfactant) No more thermosensitive effect at the interface lengthscale.
- At the film lengthscale, $C_{SDS}$ is an important parameter : different behaviors can be obtained.
- Addition of SDS in a relatively high concentration (enough to make a stable foam : CMC) removes the thermosensitive effect.

Addition of surfactant could suppress this thermosensitivity.

General remarks The solutions of PNIPAM and PNIPAM-SDS have not the same histories in the interfacial measurements, in films and foam studies.
- Slow adsorption and temperature increasing rate for the interfacial studies
- Strong shear and pre-heated solution for the films/foams studies.

The link between interfacial measurements, films and foam studies is still not obvious!