

# Temperature and particle concentration influence on the complex viscous behavior of a hydrophilic fumed silica suspension

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## Motivation

Influence of solid concentration and temperature changes on *shear stress characteristic values* of shear-thickening behavior.

## Stress and Microstructure

Shear stress is the real cause of microstructure changes<sup>1</sup>.

Microstructural state results from the balance between external and internal forces<sup>2</sup>.

Shear thickening behavior in fumed silica suspensions is due to hydroclusters formation<sup>3</sup>.

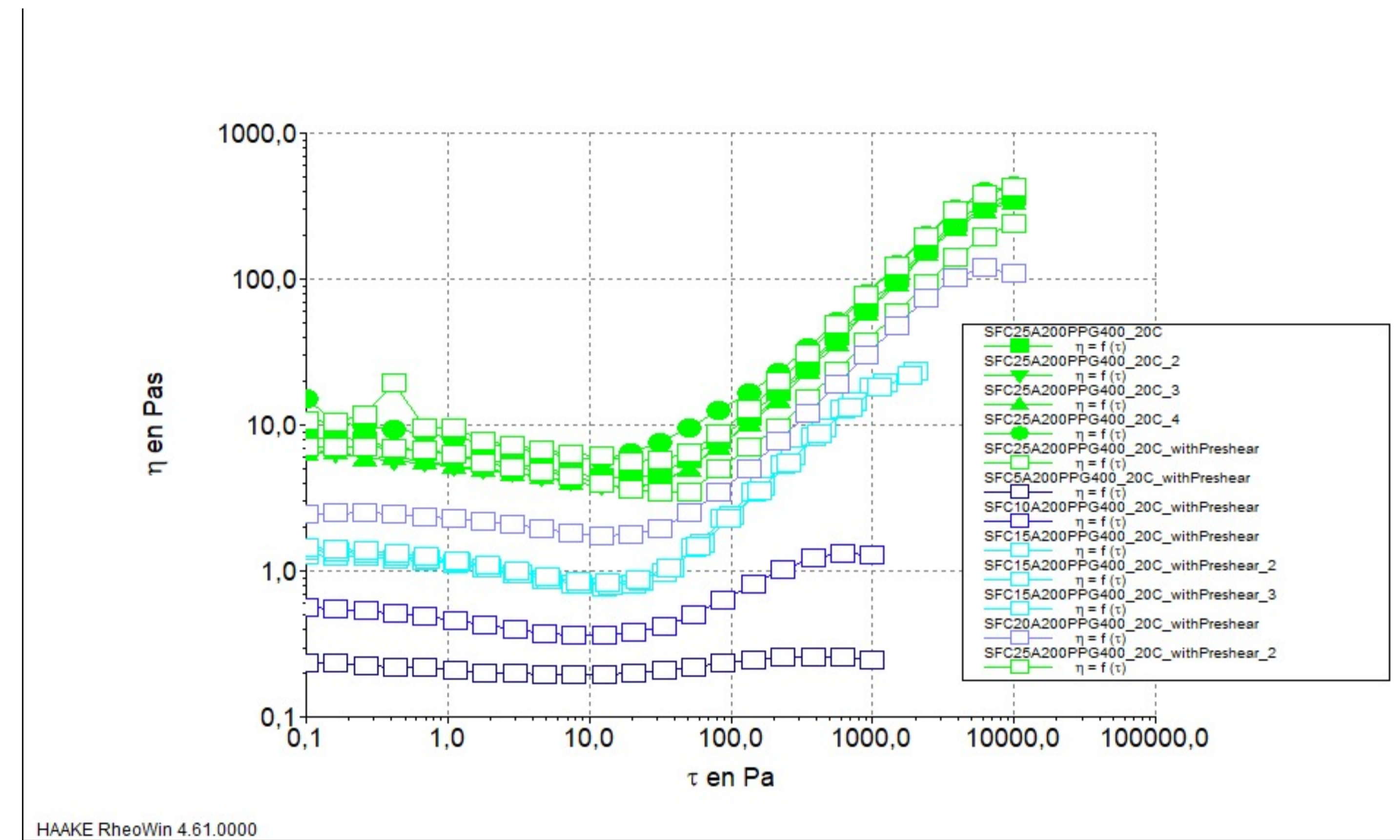
Induced stresses conditions the evolution of hydroclusters.

Empirical equation for the effect of induced stresses on the microstructural state (viscosity)<sup>4</sup>.

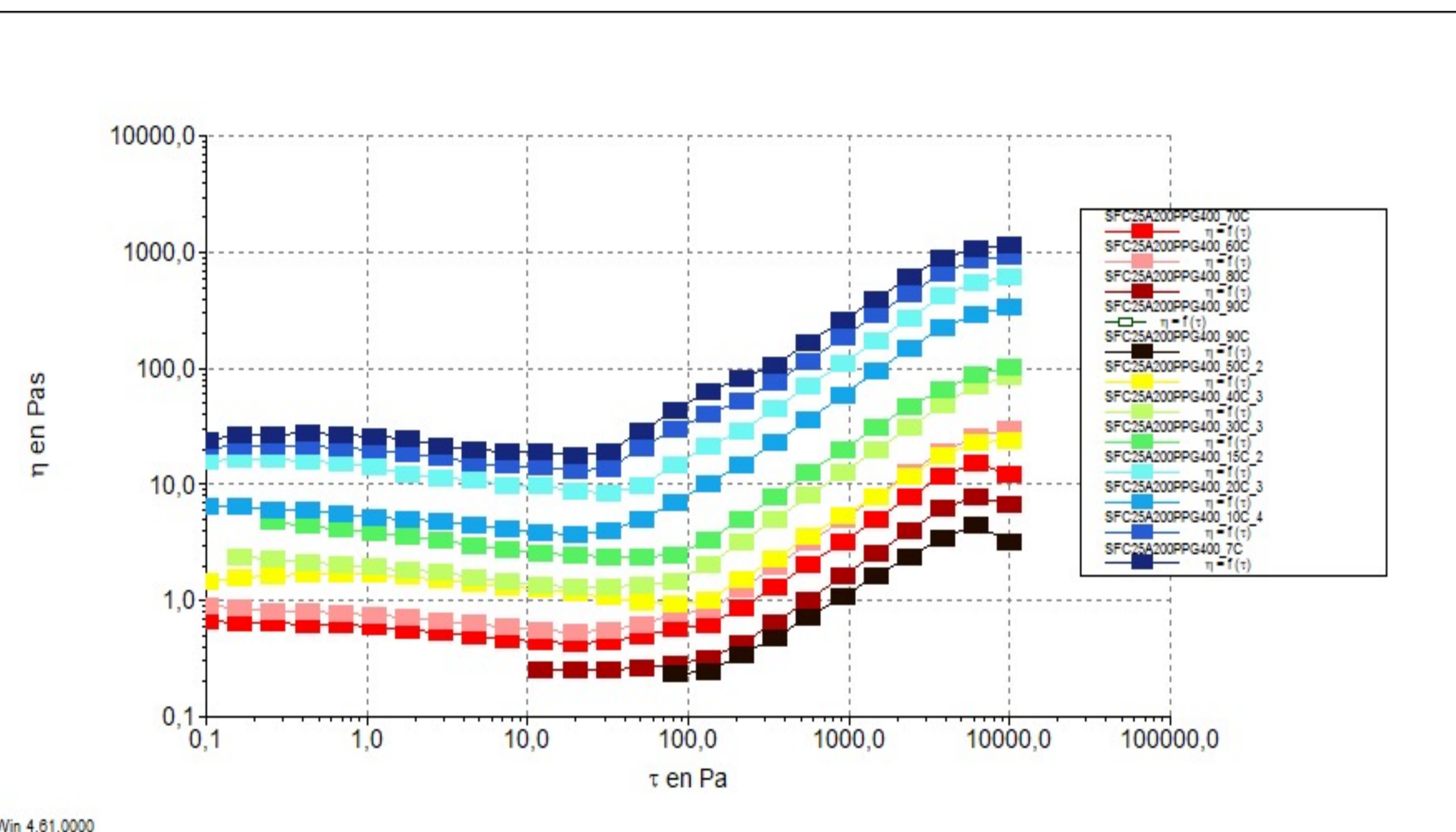
## References

1. PR de SouzaMendes, RL Thompson. Curr. Opin. Colloid In. 43 (2019) 15-25.
2. RG Larson. The structure and rheology of complex fluids. Oxford University Press, New York 1999.
3. FJ Rubio-Hernández, AI Gómez-Merino, R Delgado-García, NM Páez-Flor. Powder Technol. 308 (2017) 318-323.
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## Results



Intrinsic viscosity decreases. Therefore, the volume fraction of particles in a hydrocluster increases and the number of hydroclusters decreases with temperature.



Activation enthalpy  $\Delta H_s$  and activation entropy  $\Delta S_s$  are both positive no matter the solid phase concentration.

## Experimental

