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Rheology and adhesion of droplets in a soft elastic matrix

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► **To cite this version:**

Elina Gilbert, Anniina Salonen, Christophe Poulard. Rheology and adhesion of droplets in a soft elastic matrix. International School of Soft Matter, Jul 2022, Cargese, France. hal-03781862

HAL Id: hal-03781862

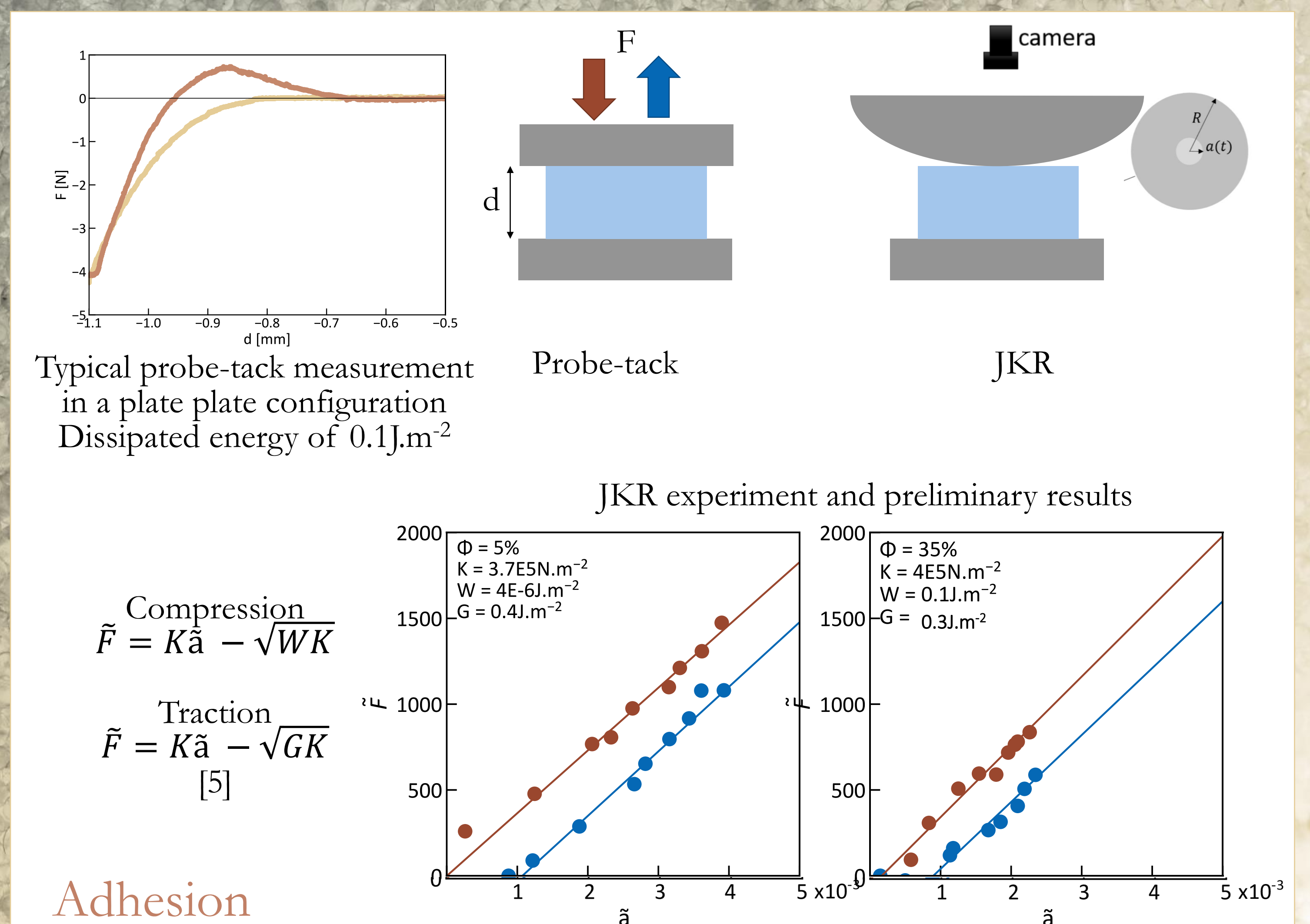
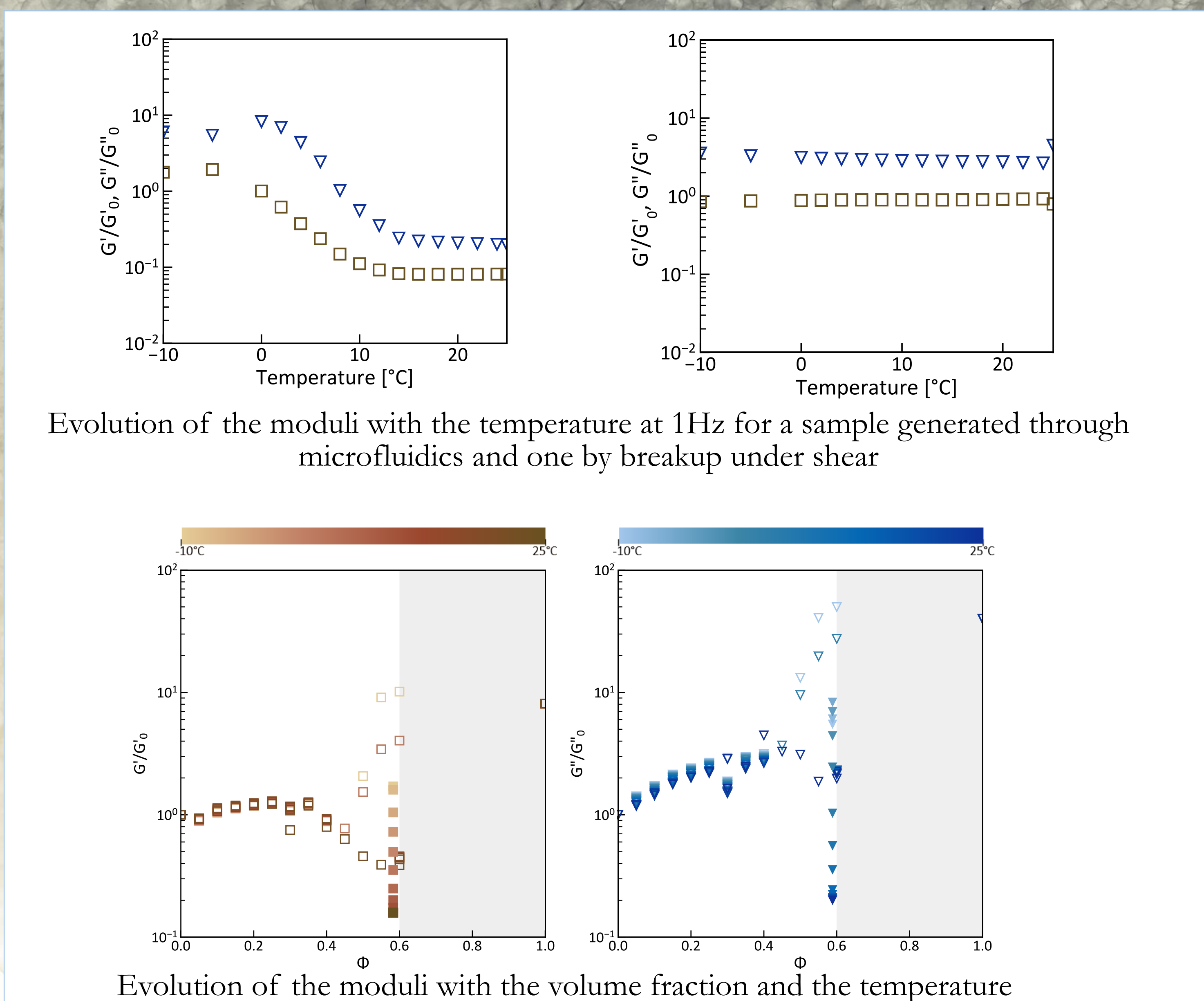
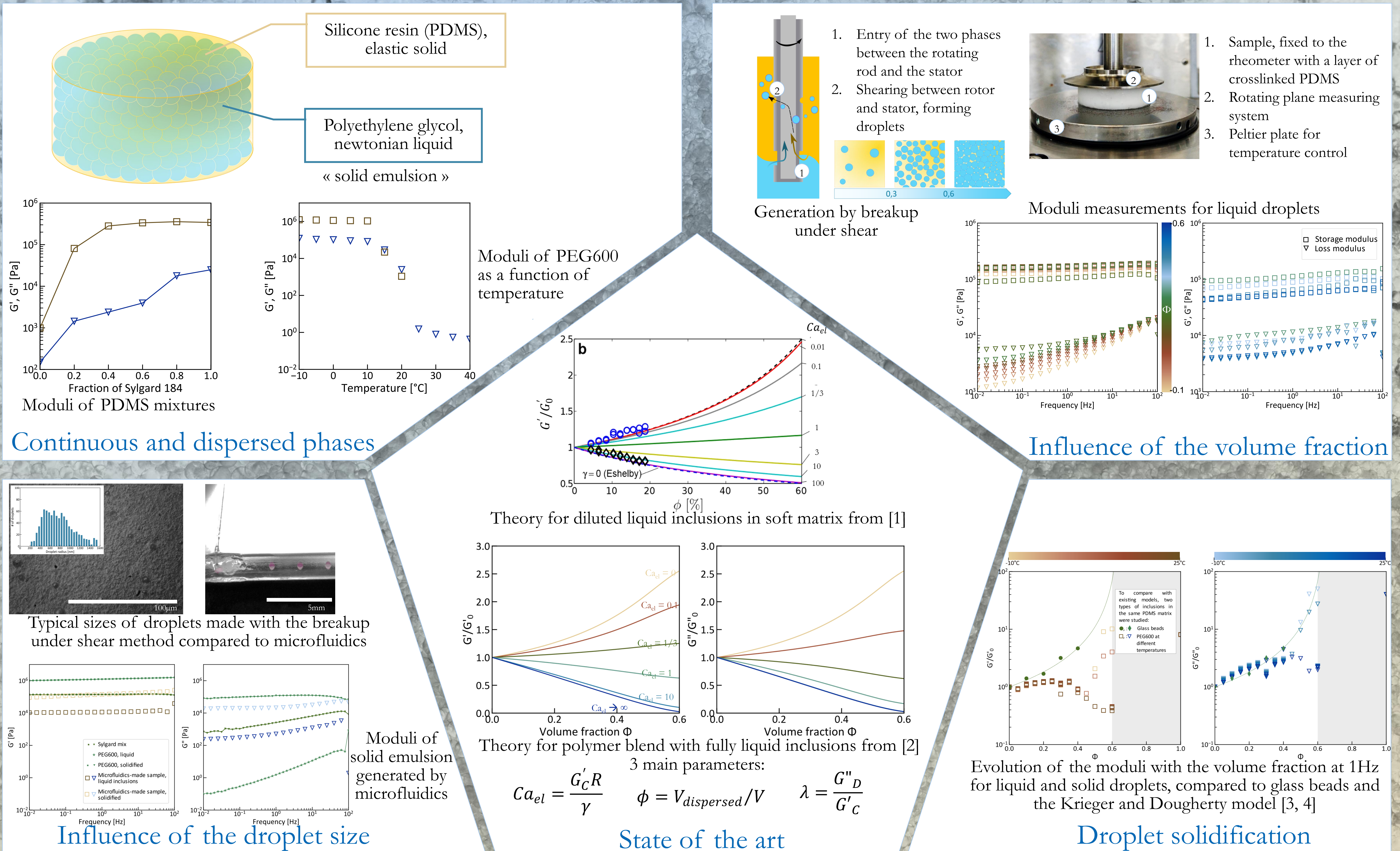
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Submitted on 20 Sep 2022

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We first show the feasibility of a “solid emulsion” composite system whose storage and loss moduli can be controlled independently. We study the mechanisms for such a decorrelation. For our system, we have observed a decoupling of the storage and loss moduli in the rheological response for small polydisperse liquid insertions in the matrix. When the droplets are solid, we observe however a deviation from the expected behavior solely controlled by the matrix and the volume fraction, that we investigate through rheology and compression-decompression experiments.



- Decoupling of the storage and loss moduli at low to middle volume fraction
 - Strong influence of the volume fraction on the loss modulus
 - Crystallization of the dispersed phase shows unexpected behavior
Hypothesis: polydispersity, influence of confinement on solidification
 - Adhesive samples with no apparent change of adhesive properties with the volume fraction at low volume fraction
- Generation of more monodisperse samples, for different droplet sizes
- Study of adhesion with temperature change and more volume fractions

Conclusion & perspectives

[1] Style et al., 2014, Nature Physics, 11, 2
[2] Palierne, 1990, Rheologica Acta, 29, 3
[3] Krieger, Dougherty, 1959, Transactions of the Society of Rheology, 3, 1
[4] Mahaut et al., 2008, Journal of Rheology, 52, 287
[5] Johnson, Kendall, Roberts, 1971, Proceedings of the Royal Society of London A, 324

References