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## **Impact of continuous phase and particle content on rheological behaviour of apple cells suspensions**

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HAL Authorization

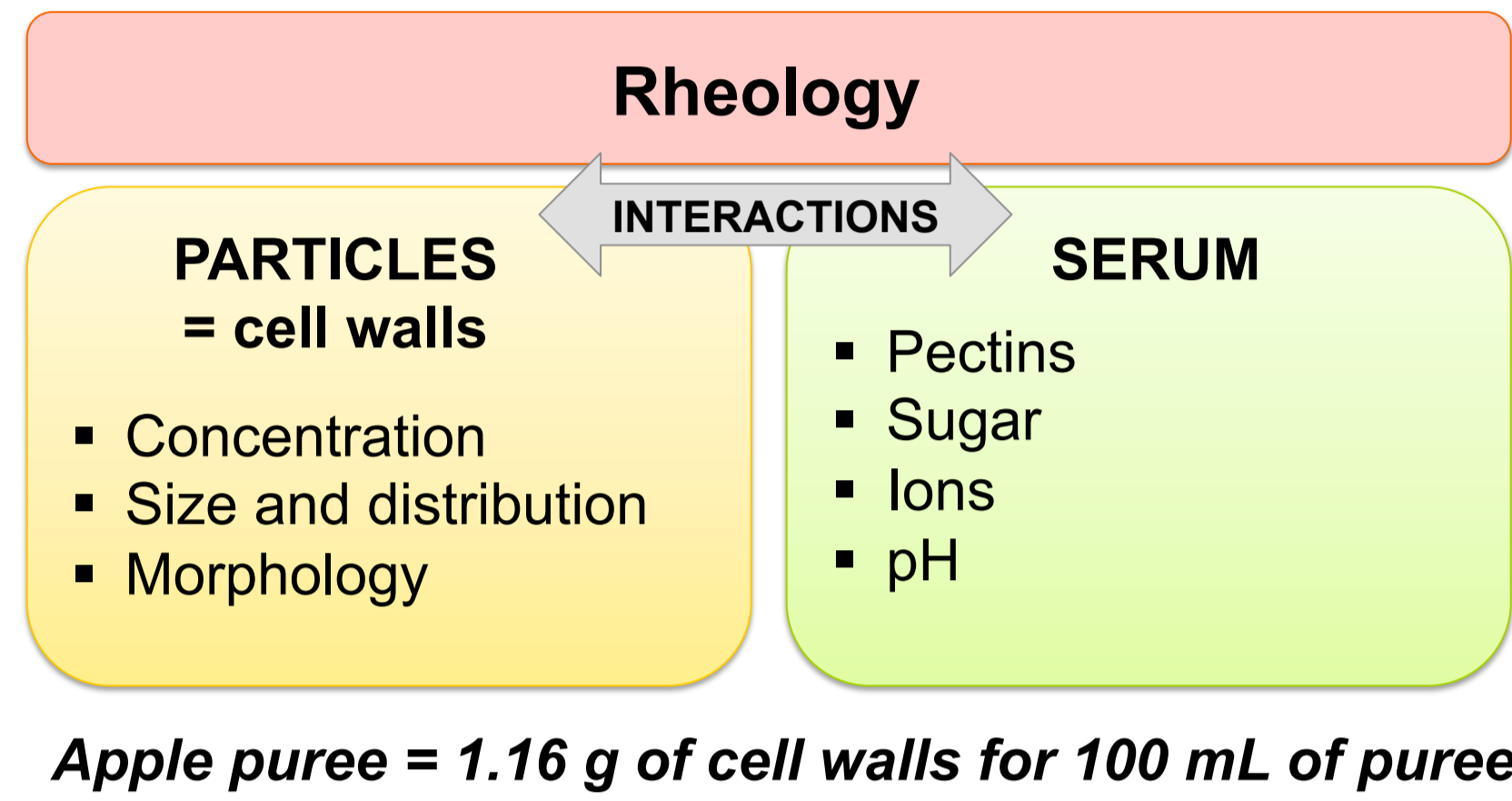
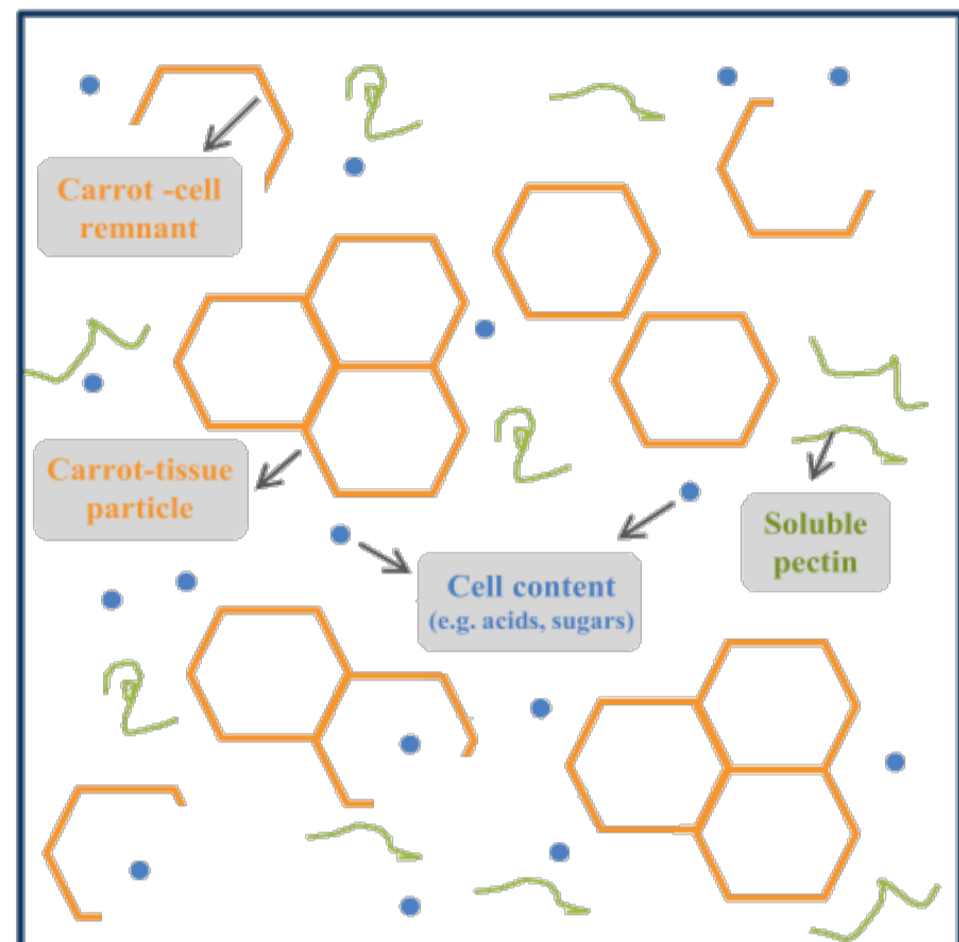
## Research question:

How does continuous medium impact rheological behaviour of fruit suspensions ?

## Strategy & Context

In food industry, controlling texture allows to generate innovative products and to deal with consumer expectations.

Fruit purees = suspensions of deformable cells or cell clusters

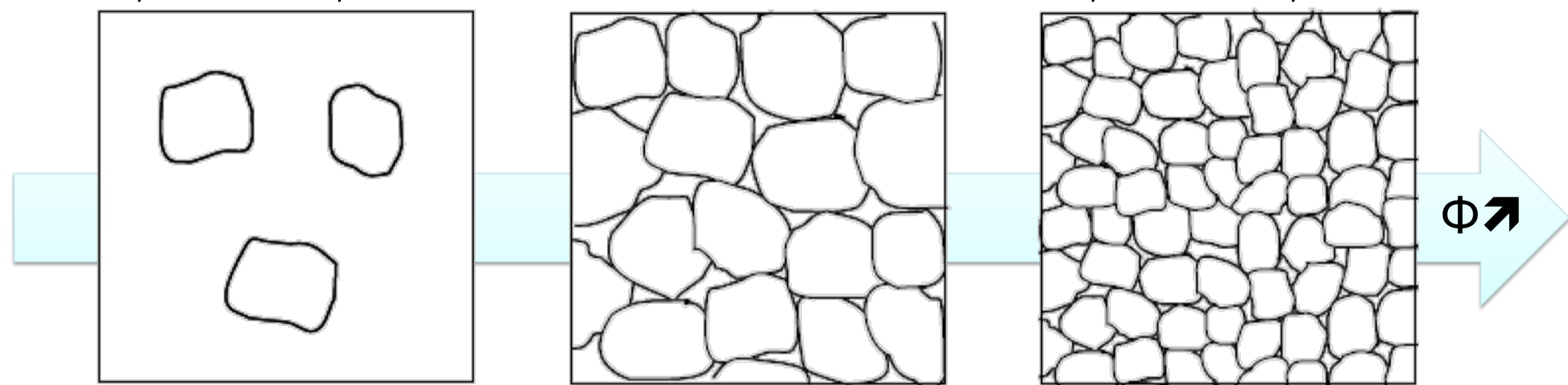


Construction of apple cells suspensions varying in :

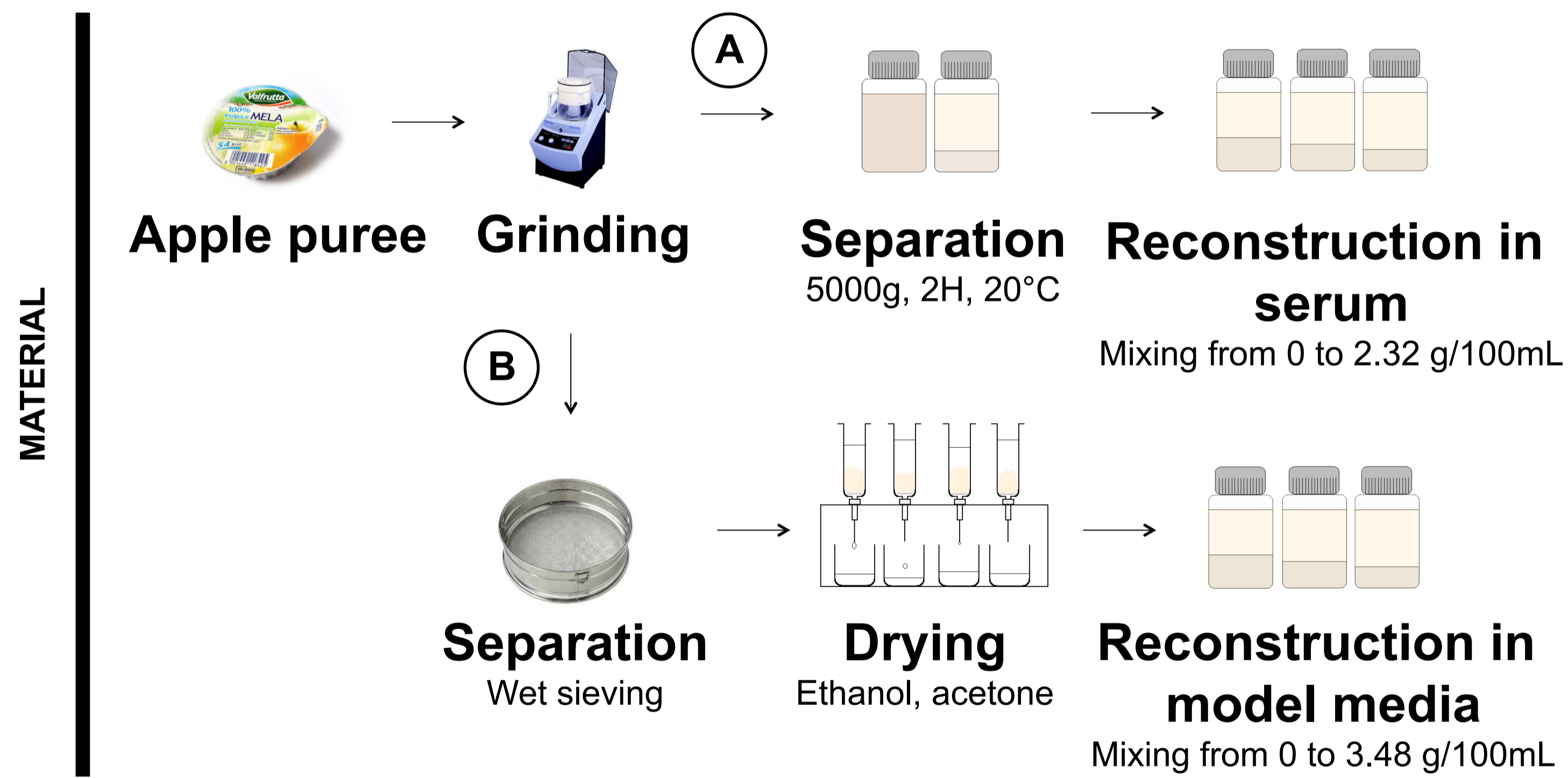
- ✓ particle concentration (from 0 to 3.48g/100mL)
- ✓ continuous phase

$$V_{particle} = V_{equilibrium}$$

$$V_{particle} < V_{equilibrium}$$



## Material and Methods



	Water	NaCl 0.1%	Sucrose 48% <sub>m</sub>	Serum	CMC 1%	CMC 3.2%
$\eta$ mPa.s	1	1	13	13	13	108
$\rho$ g.cm <sup>-3</sup>	0.9982	1.000	1.219	1.051	1.006	1.018
Conductivity $\mu S/cm$	0.80	1750	18	1730	2000	6000

## Rheology

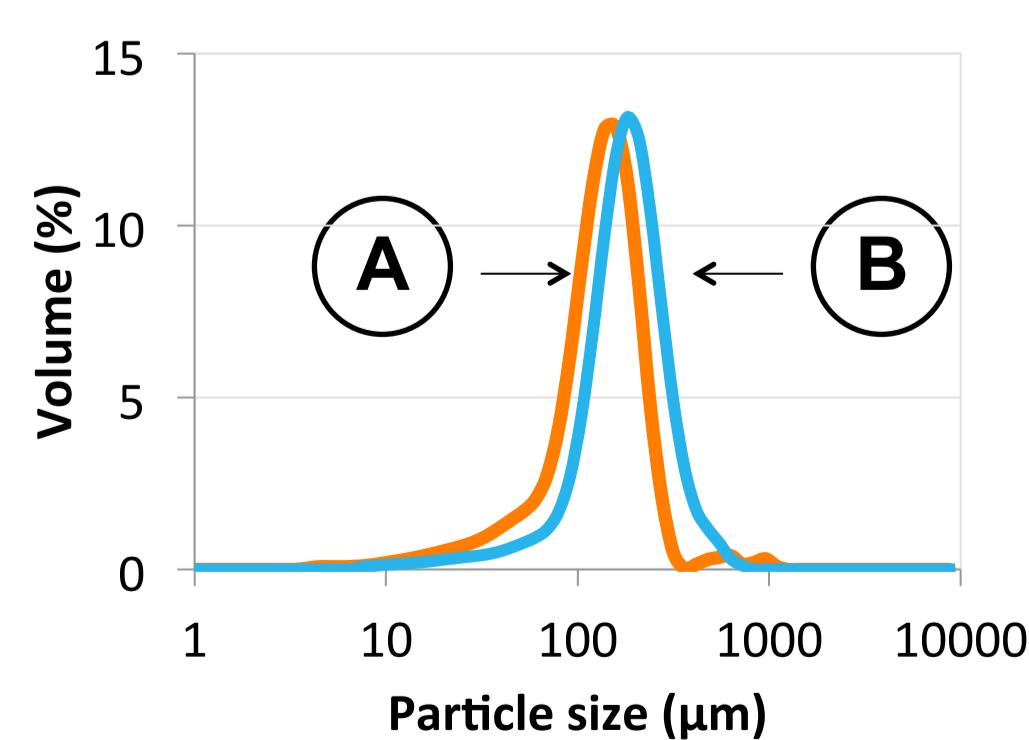
MCR 301, Anton Paar, using large gap coaxial cylinders ( $\delta r=5mm$ )

### Steady-state measurements

Apparent viscosity after 1min at 50s<sup>-1</sup>

### Oscillatory measurements

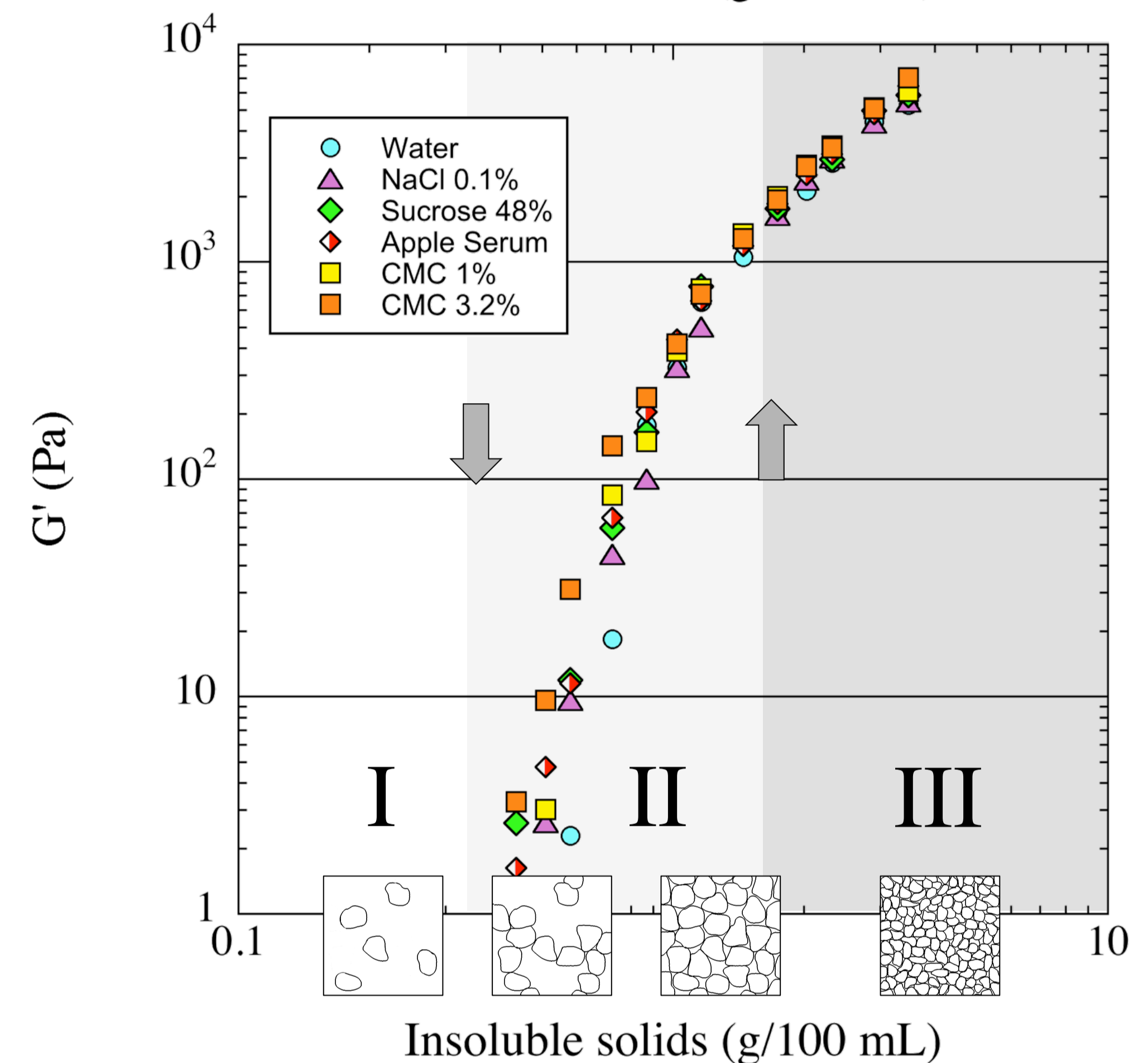
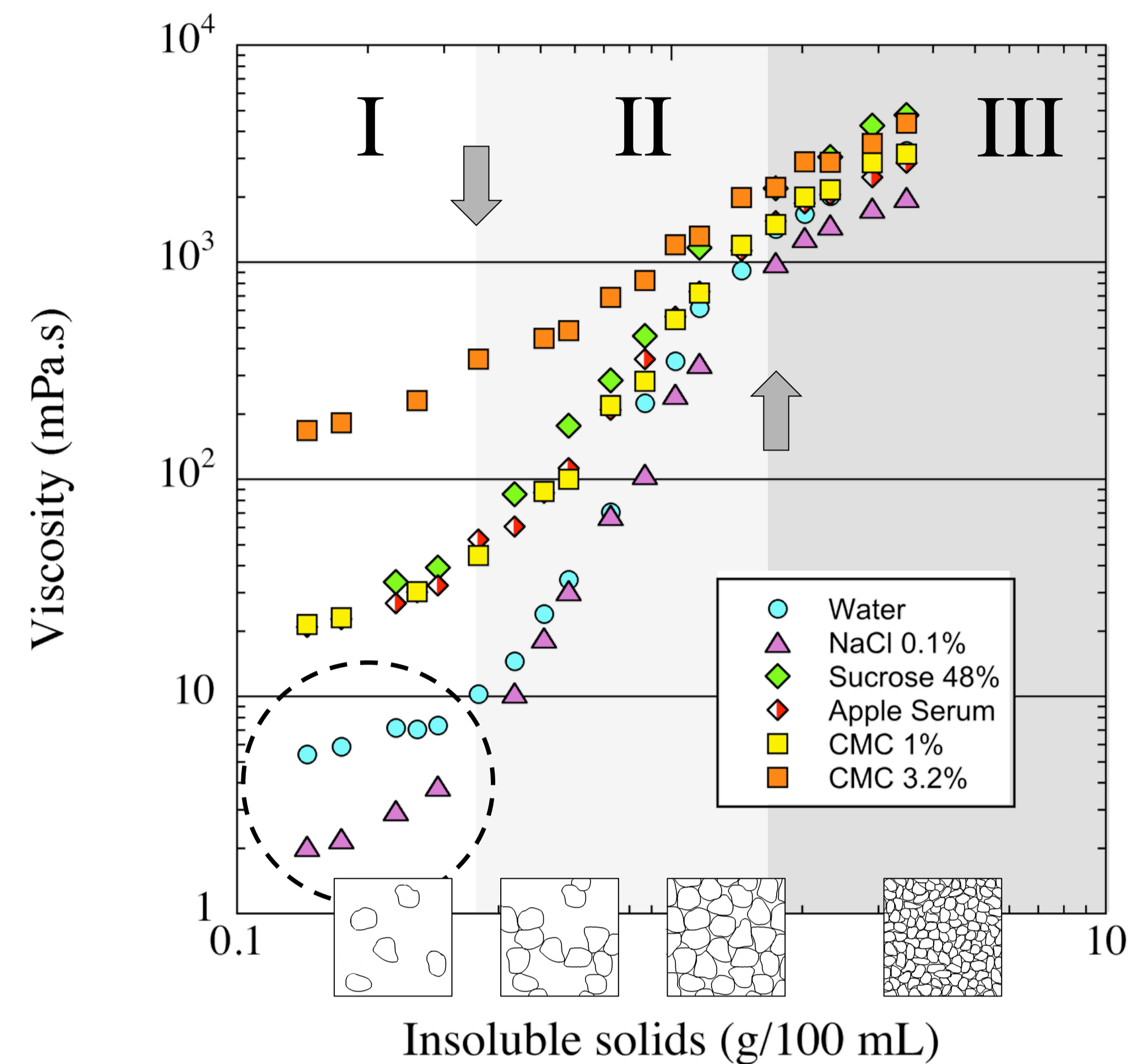
Strain sweep from 0.015% to 150% was performed at 10rad.s<sup>-1</sup>.



## Particle size distribution

Mastersizer 2000, Malvern

## Results



## Conclusions

Rheological parameters increase with the particle content. This study confirms that **particle content** has a **major impact** on rheological behaviour of apple cells dispersions, and highlights **three concentration domains**, both in flow and dynamics measurements.

- The **diluted domain** exhibits Newtonian flow. Ionic strength appears to impact only in distilled water inducing electrostatic repulsion between particles which increases viscosity values.
- The **intermediate domain** is characterised by the building of a weak network between particles. Continuous phase have a little effect in this domain, but its viscosity and ionic strength seem to impact the elastic modulus in this domain.
- In the **concentrated domain**, the dependency between viscosity and concentration decreases. Particles begin to pack and their volume becomes lower than their equilibrium volume. Continuous phase has no longer any impact on  $G'$ , the interactions between particles are the only parameters affecting elastic properties in this domain.

The continuous phase seems to have no impact on transition domains.

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