Dried whey protein fractal aggregates for substituting texturizing additives in dairy products

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Dried whey protein fractal aggregates for substituting texturizing additives in dairy products

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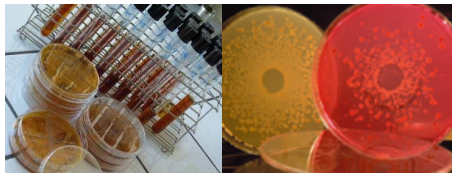
AGRO CAMPUS OUEST
Valorial OSONS L'ALIMENT PLUS INTELLIGENT
Bba
Région PAYS DE LA LOIRE
Région BRETAGNE
Milk Valley PROFIL

A multidisciplinary and multiscale approach, reinforced by two high-calibre facilities:

Dairy Platform

Biological Resource Centre



STLO

- **Structuration / destructuration mechanisms of food matrix:**

  from structural characterisation to digestion

- **Dairy processing and cheese making:**

  toward sustainable dairy systems

- **Microbial interaction:**

  food matrix and host cell

CONTEXT

Consumer expectation

- Good organoleptic quality
- More natural and healthy products

Milk Valley PROFIL

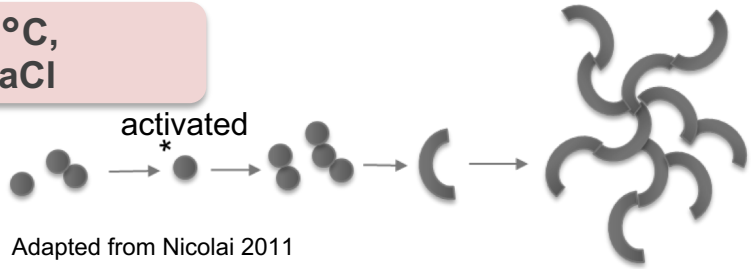
2014-2019
Joelle LEONIL

Industrial expectation

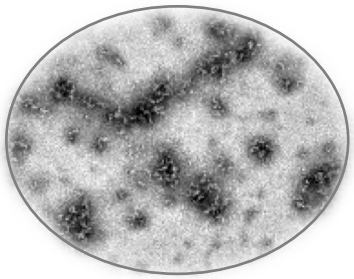
- Target regular products properties by using additives
- Use less additives as possible (Clean label)
- **Add value to milk protein (technofunctional interest)**

Fractal aggregates : Whey protein aggregates

WPI, 80°C, pH 8, NaCl

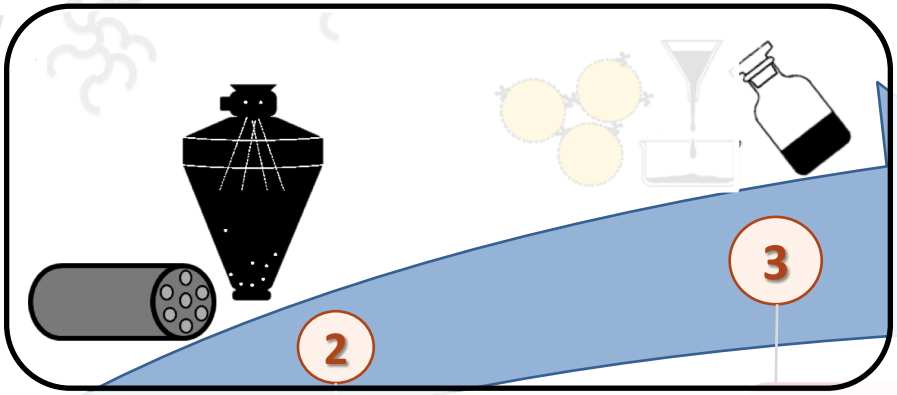


Adapted from Nicolai 2011



- Repeated pattern
- Soluble
- Low density

PROPERTIES OF FRACTAL AGGREGATES AND RESEARCH QUESTION



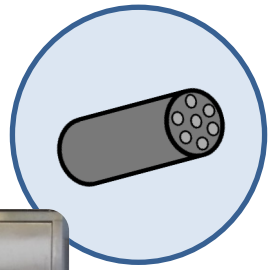
Research question

What is the impact of the concentration and drying operations on the cold gelation functionality of fractal aggregates

AGGREGATES PRODUCTION AND STABILIZATION

Pilot scale

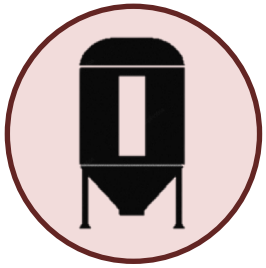
100L



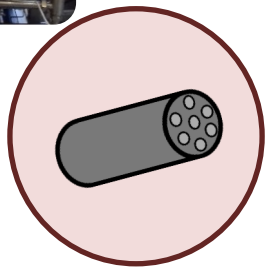
Vol : 40L

5 kg water.h^{-1}

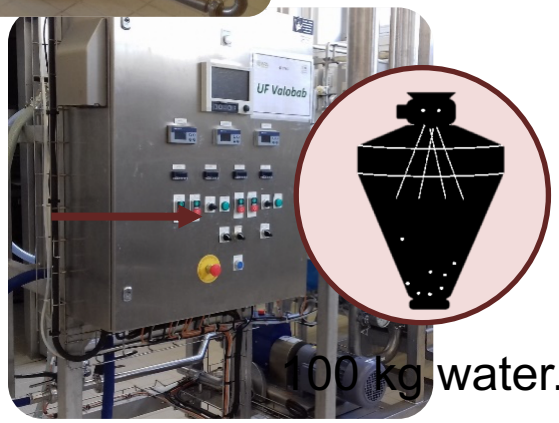
Industrial scale



400L



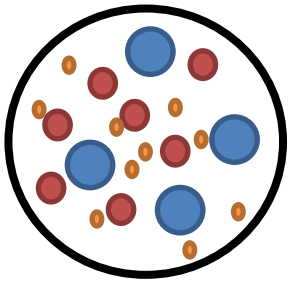
Vol : 400L



100 kg water.h^{-1}

SIZE CHARACTERIZATION BY A4F

Asymmetrical Flow Field-Flow Fractionation (A4F)



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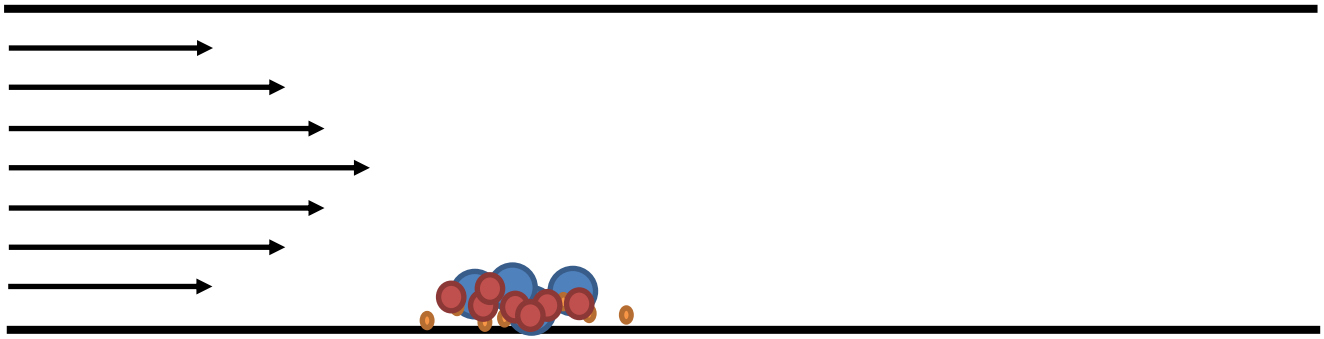

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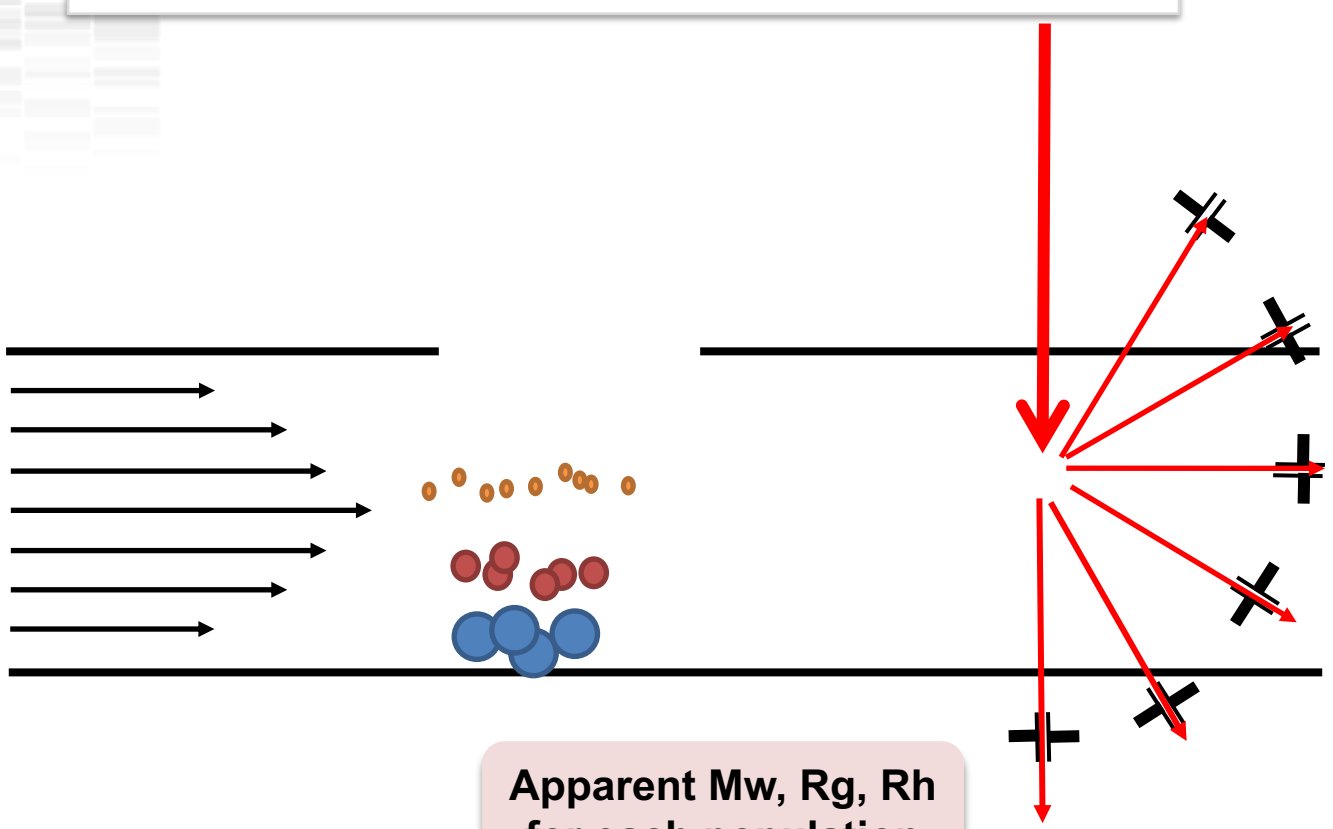
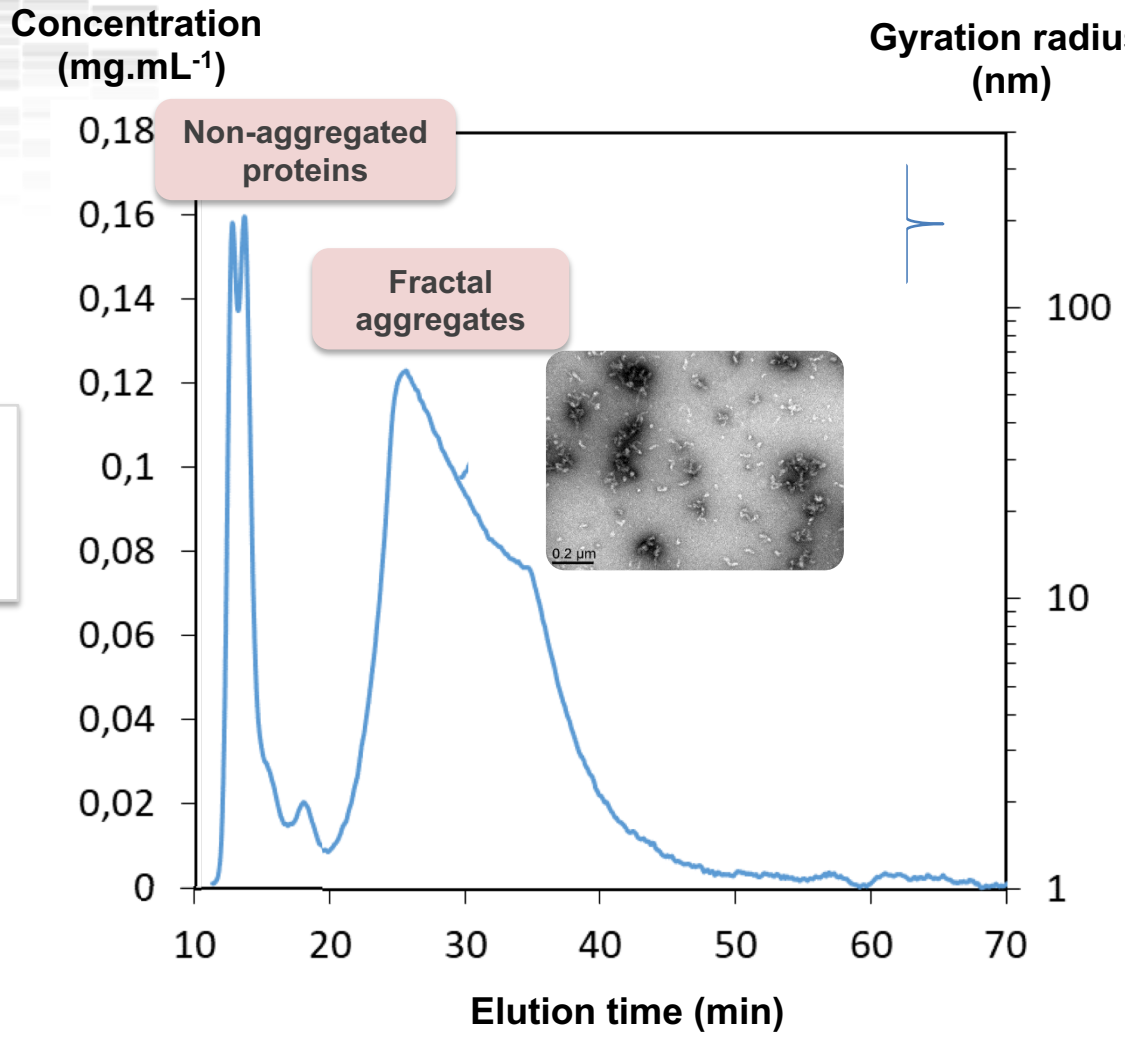


Apparent Mw, Rg, Rh for each population

SIZE CHARACTERIZATION BY A4F

Asymmetrical Flow Field-Flow Fractionation (A4F)

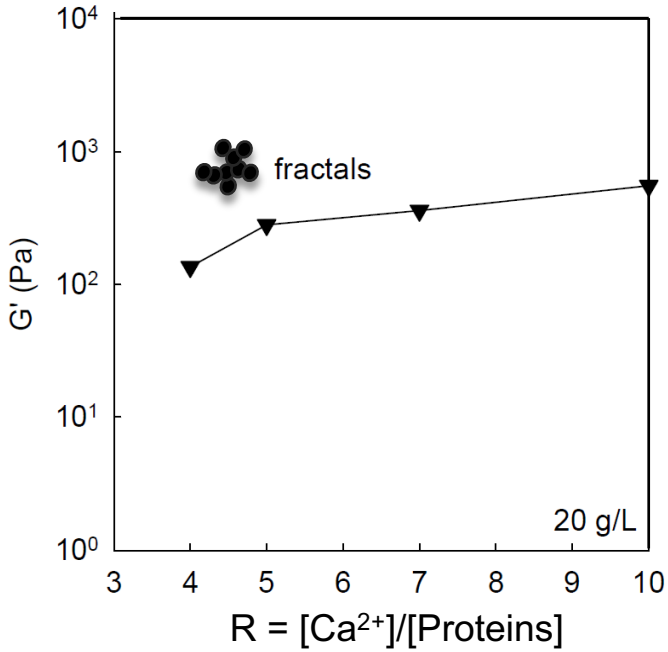


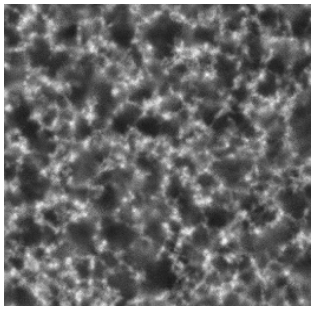
COLD GELATION PROPERTIES OF FRACTAL AGGREGATES

Cold Gelation

Principle
Reduce electrostatic repulsion to form gel witout the use of heating

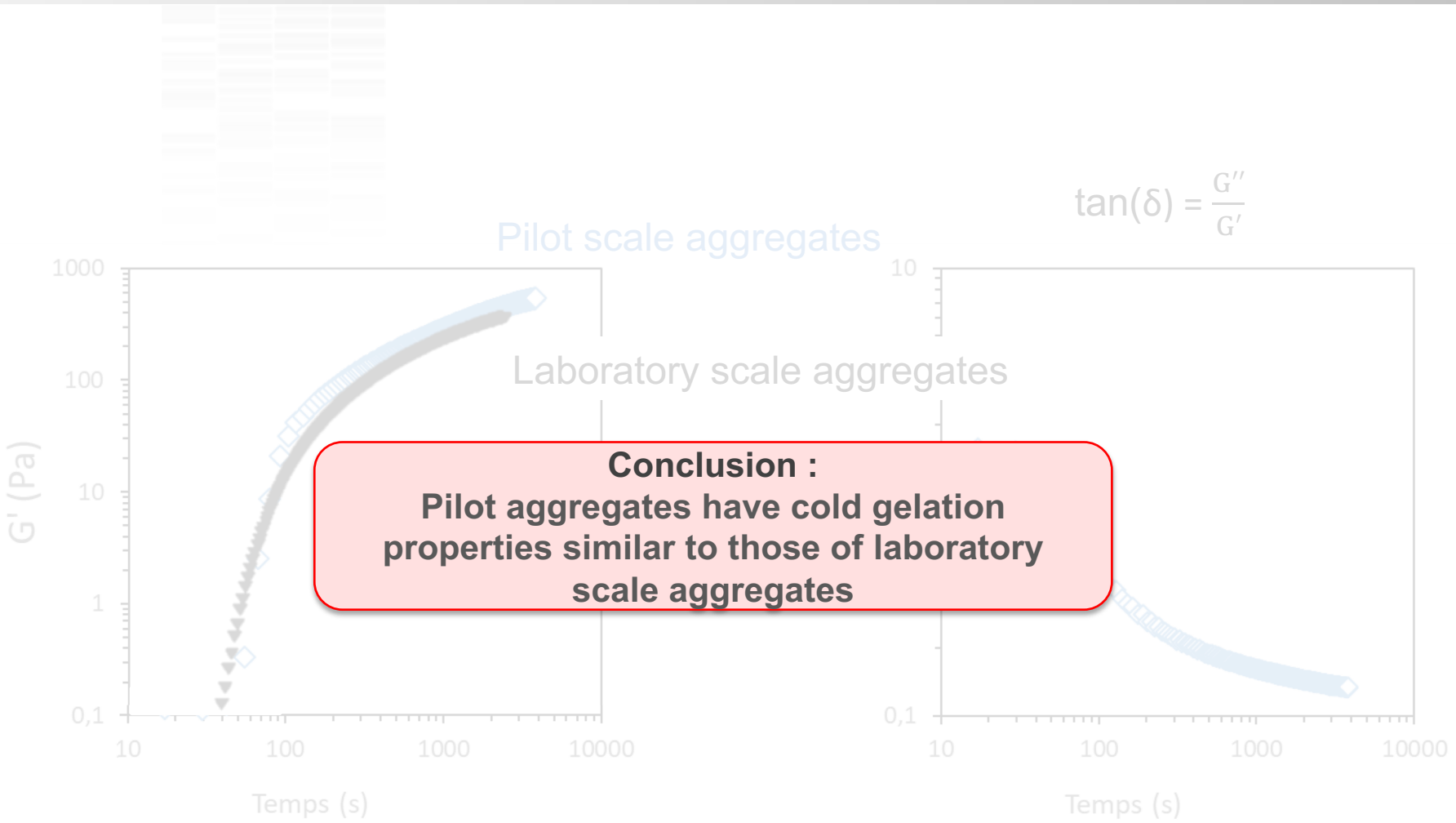
Interest
Specific food application
(fresh products ; preserve vitamins)





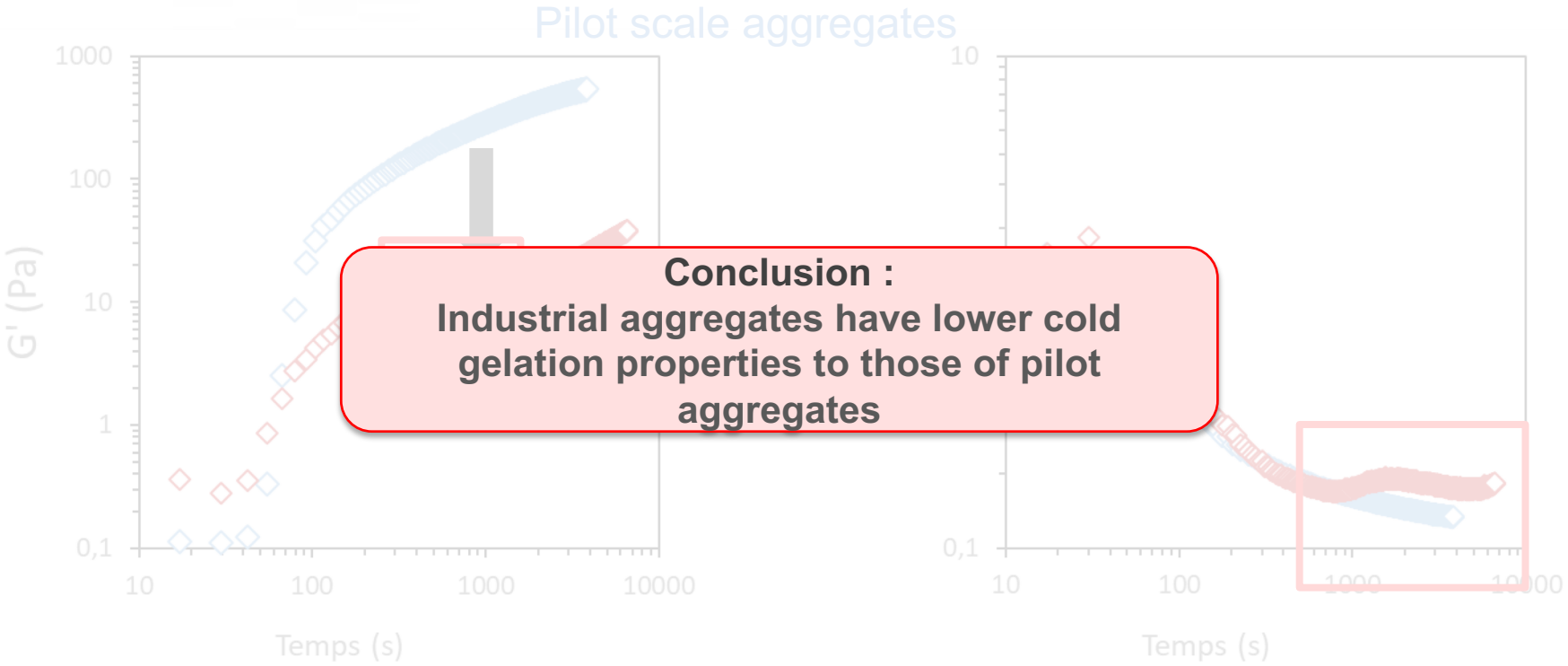
Kharlamova et al (2018)

COLD GELATION PROPERTIES OF PILOT & LABORATORY SCALE AGGREGATES



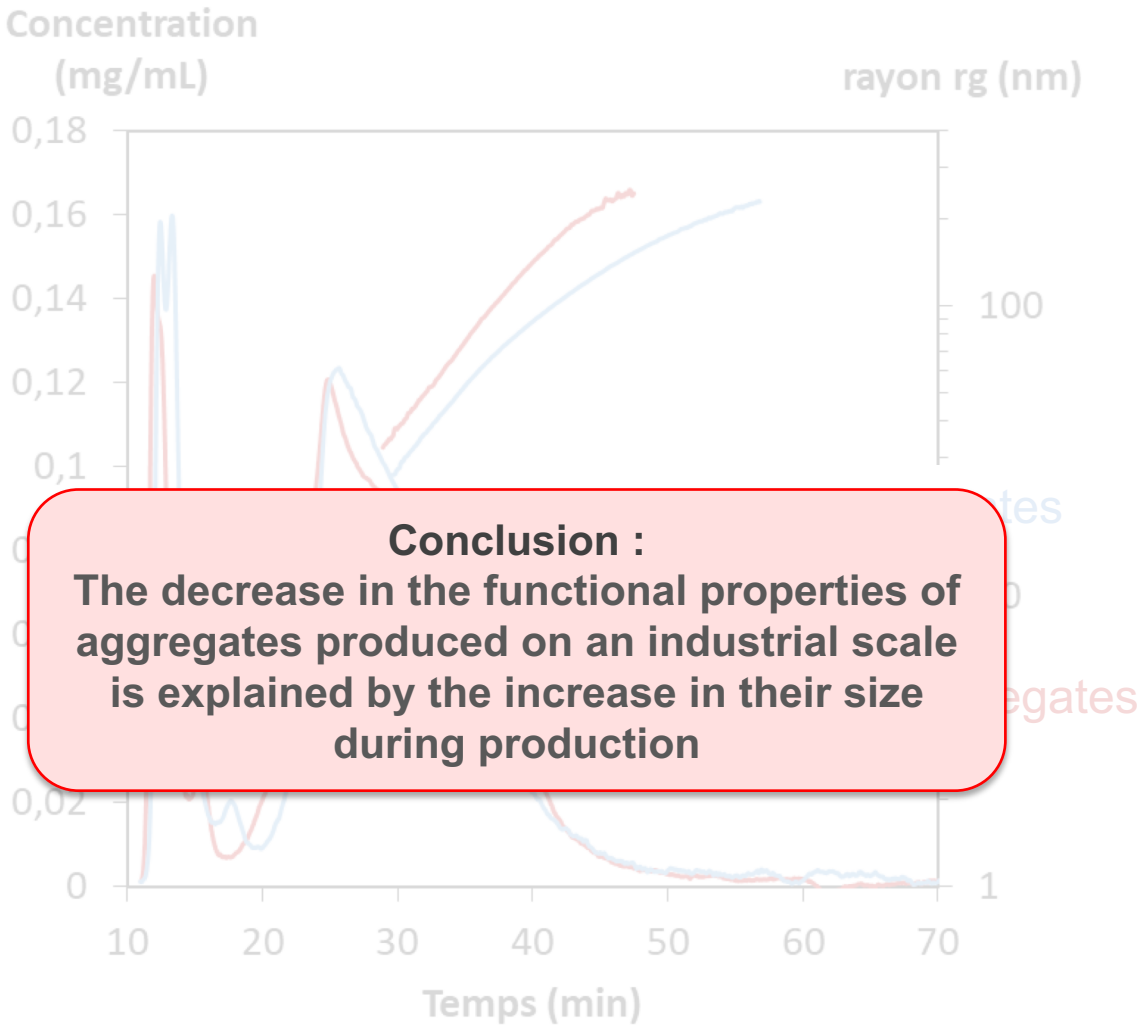
Conclusion :
Pilot aggregates have cold gelation properties similar to those of laboratory scale aggregates

COLD GELATION PROPERTIES OF PILOT & INDUSTRIAL SCALE AGGREGATES

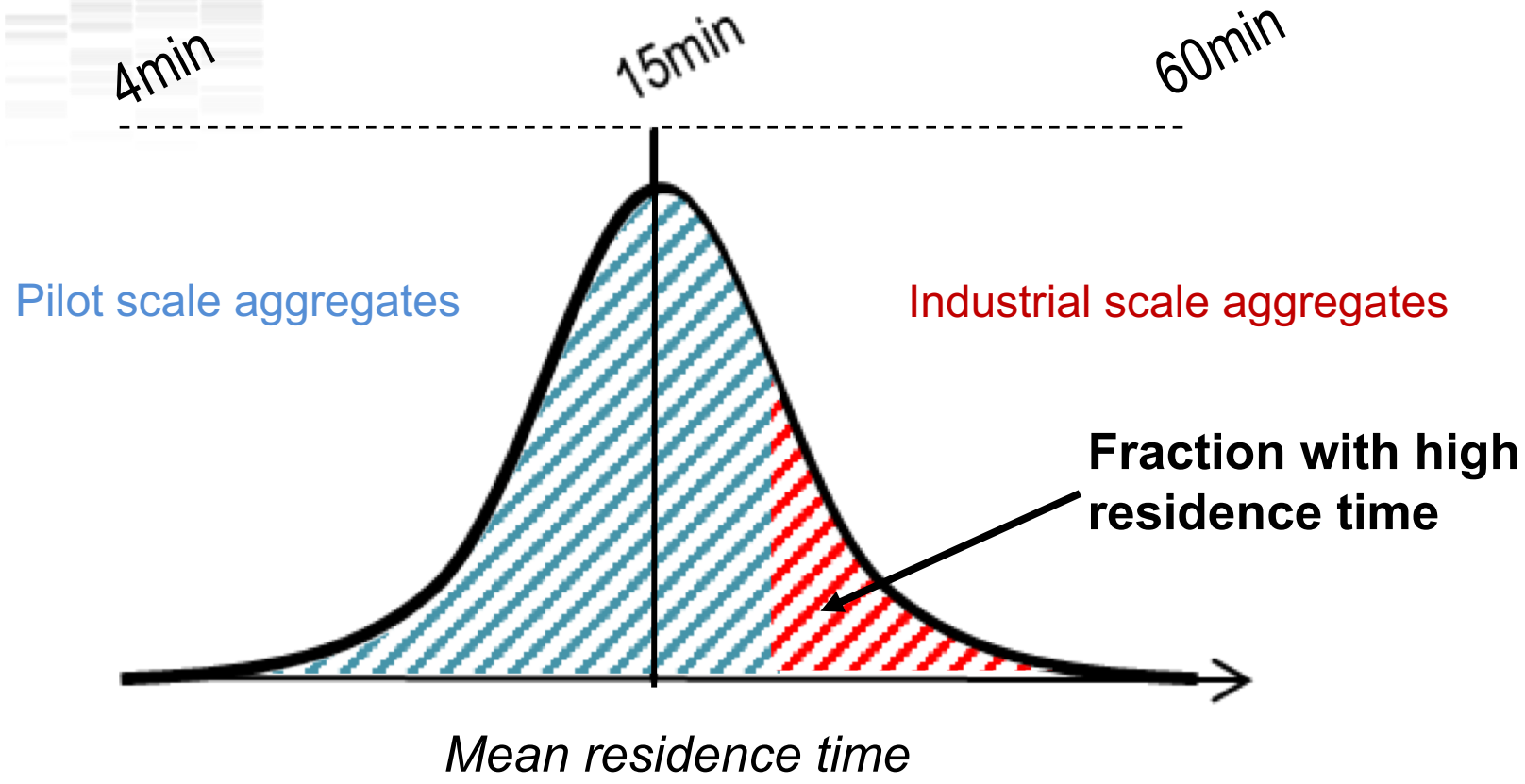


Conclusion :
Industrial aggregates have lower cold gelation properties to those of pilot aggregates

SIZE INCREASE OF THE AGGREGATES AT INDUSTRIAL SCALE



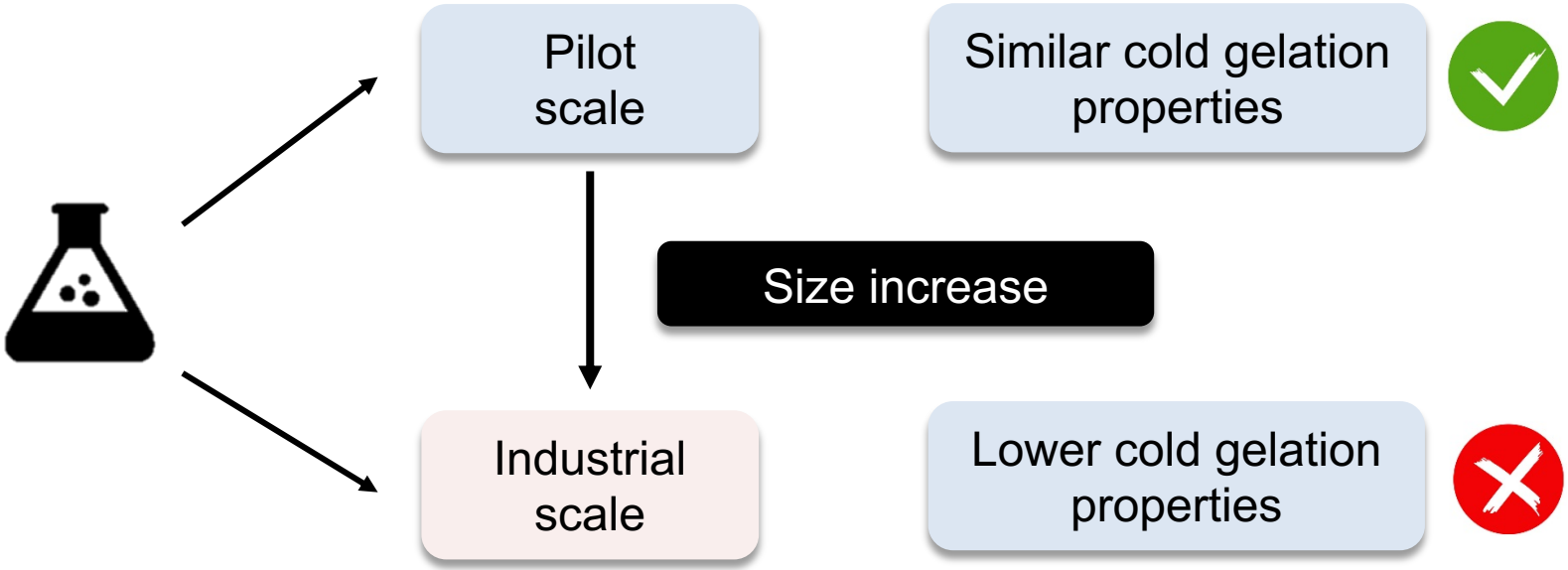
Conclusion :
The decrease in the functional properties of aggregates produced on an industrial scale is explained by the increase in their size during production


4min
15min
60min
Pilot scale aggregates
Industrial scale aggregates
Fraction with high residence time
Mean residence time

CONCLUSION

Research question

What is the impact of the concentration and drying operations on the cold gelation functionality of fractal aggregates



Thank you for your attention

STLO