

# VerAdMa project - Production of complex-shaped glass parts using additive manufacturing methods

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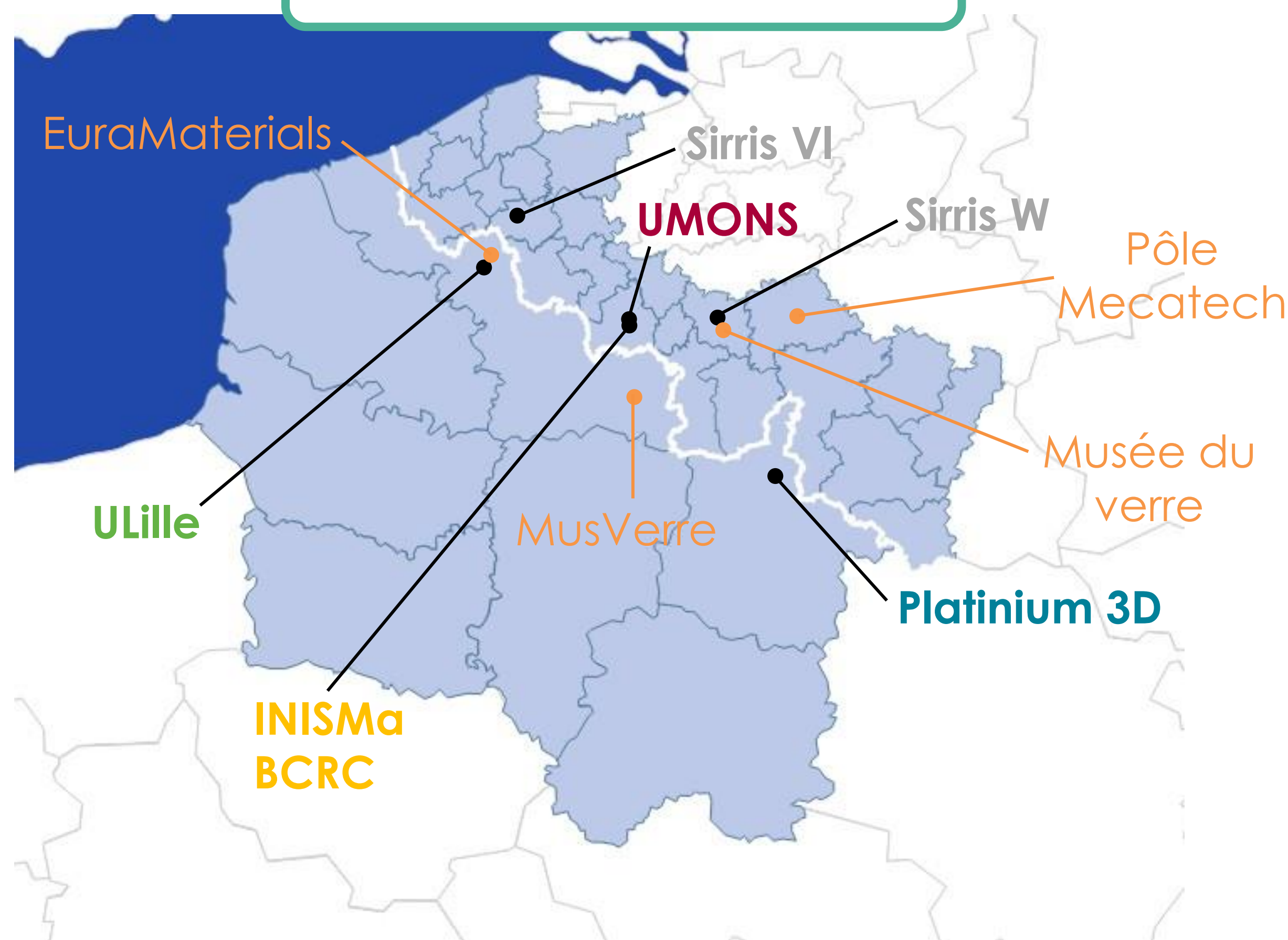
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## Context

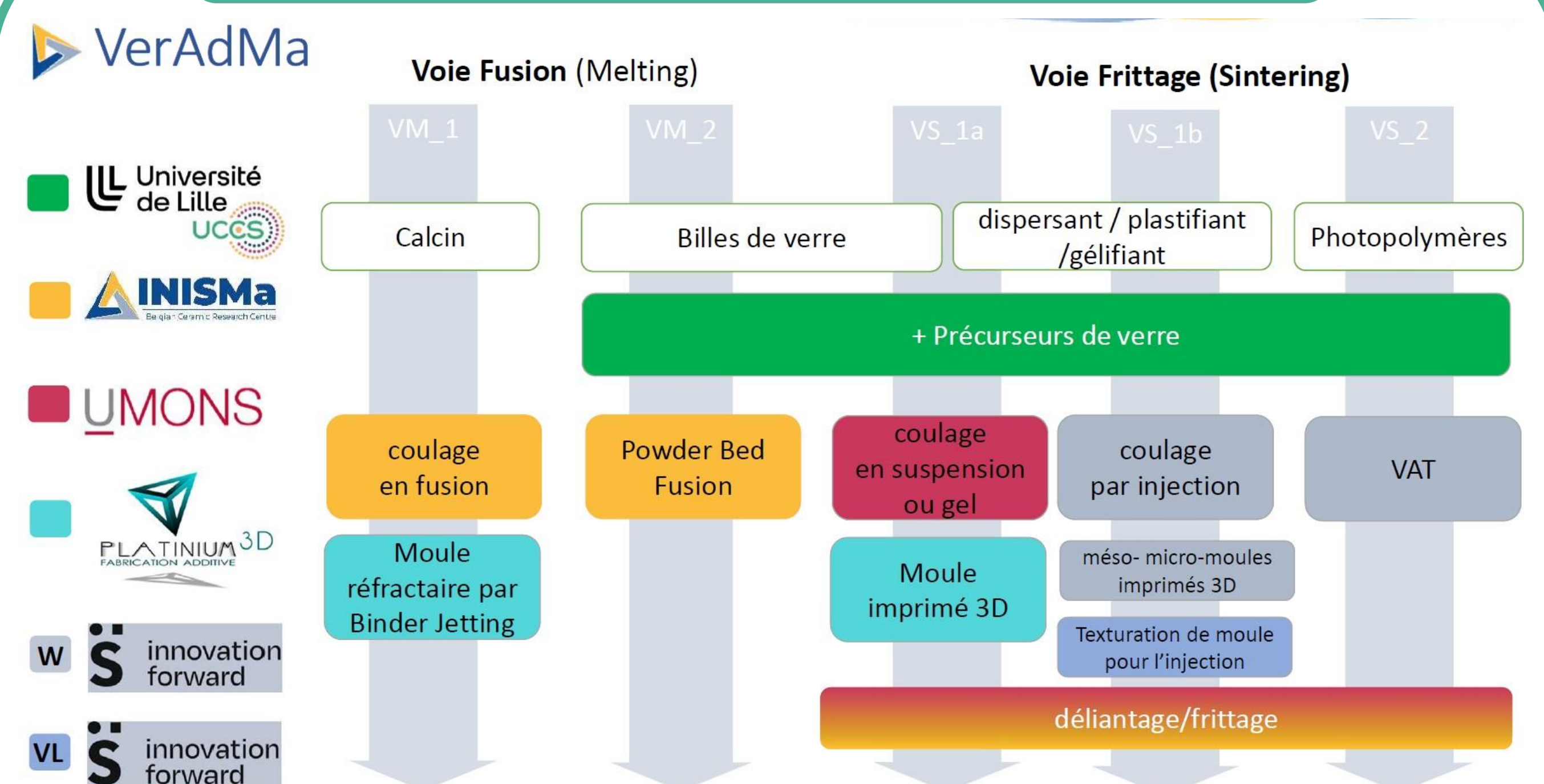
Interreg FWVL VerAdMa Project (Le VERre se vit en ADditive MANufacturing)

- Objective : To promote the development of innovative additive approaches to glass shaping.
- Academic, industrial and research center stakeholders in the France-Wallonie-Vlaanderen (FWVL) zone.

## Partners



## The different routes



Objective: parts with satisfactory optical and mechanical properties.

## Sintering route

Shaping of a green part and thermal treatment consolidation:

- Glass powders with chemical composition depending on the targeted properties and applications.
- Possible mixing with silica precursors or additives leading to viscous flux sintering.
- Particle size distribution optimization (distribution and morphology) to increase compacity and sintering reactivity.
- Suspension preparation adapted to the shaping technology.
- Thermal cycle optimization

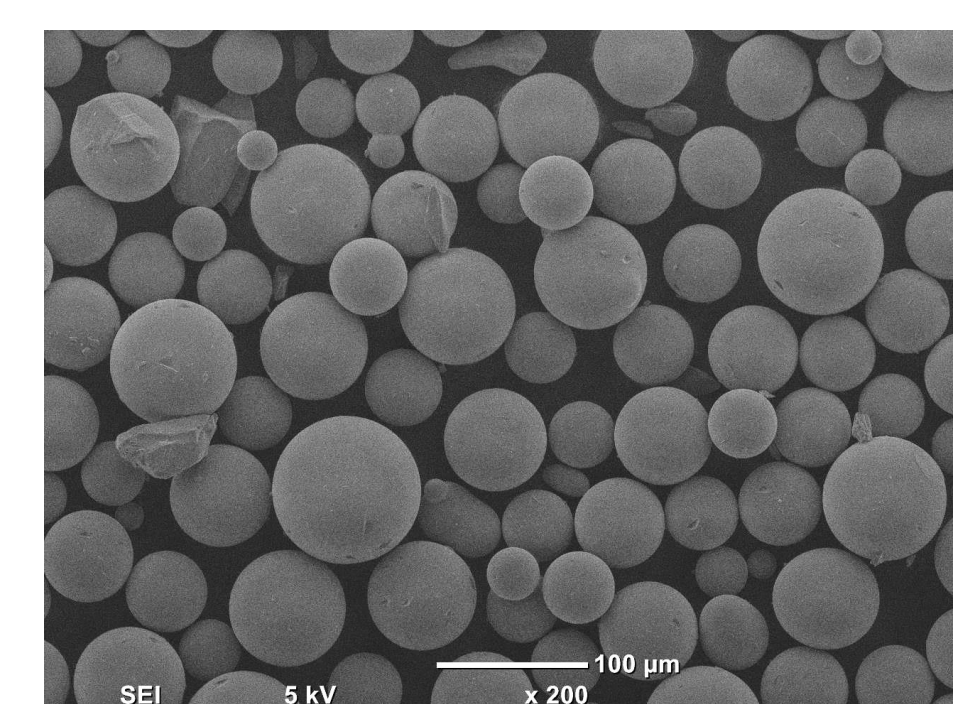
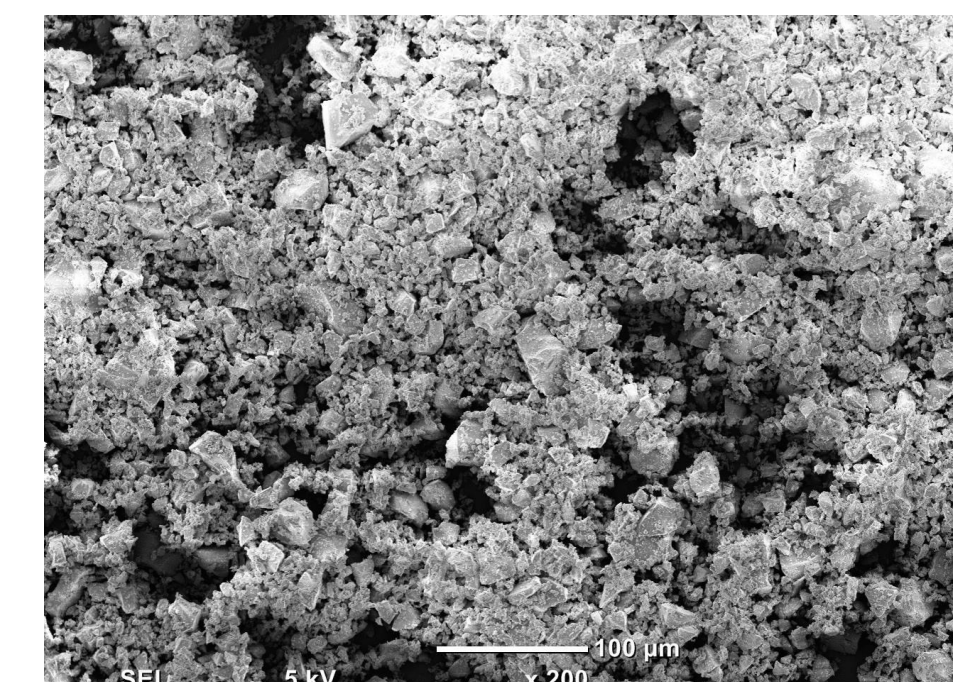
## First tests

Soda-lime glass

- Conventional composition.
- Recycling of glass bottles.
- Commercial powders with calibrated particle sizes.

Composition (wt.%)

70 % SiO<sub>2</sub>  
12.5 % Na<sub>2</sub>O  
11% CaO  
1.6% Al<sub>2</sub>O<sub>3</sub>  
1.6 % MgO  
1.5 % K<sub>2</sub>O



## Results

Soda-lime glass: unstable suspensions → sedimentation of the glass powder.  
→ effect of Na<sub>2</sub>O that causes an increase of pH.

Borosilicate glass: chemical becher → suspension more stable (2.5% Na<sub>2</sub>O).  
→ possibility of unmolding a green part.  
→ good green density (59.6 %).

## Conclusion

Suspension stability

- Soda-lime glass **✗**
- Borosilicate glass **✓**

## Perspectives

Rheology study of the suspensions

- Optimisations
- Dilatometry and thermal cycle
- Sintering study

## Acknowledgments

