The role of air incorporation in shear-induced calcium caseinate fibrous material

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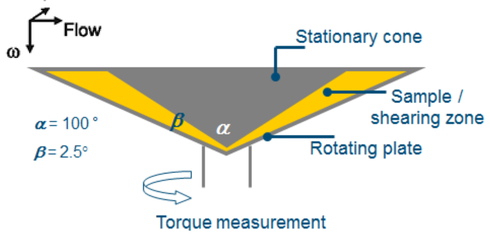
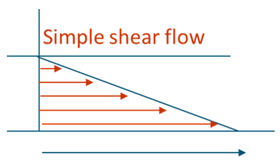
Background

A decade ago, well-defined shear flow was used to create anisotropy in dense calcium caseinate (CaCa) dispersions. The generated anisotropic structure was fibrous in appearance, which is interesting for its structural resemblance to meat. The CaCa dispersion was deformed by well-defined flow and concurrent crosslinking by transglutaminase (Tgase). The formation of this fibrous material was attributed to the aggregation of caseinate micelles, which have attractive interactions due to the presence of Ca^{2+}.

Introduction

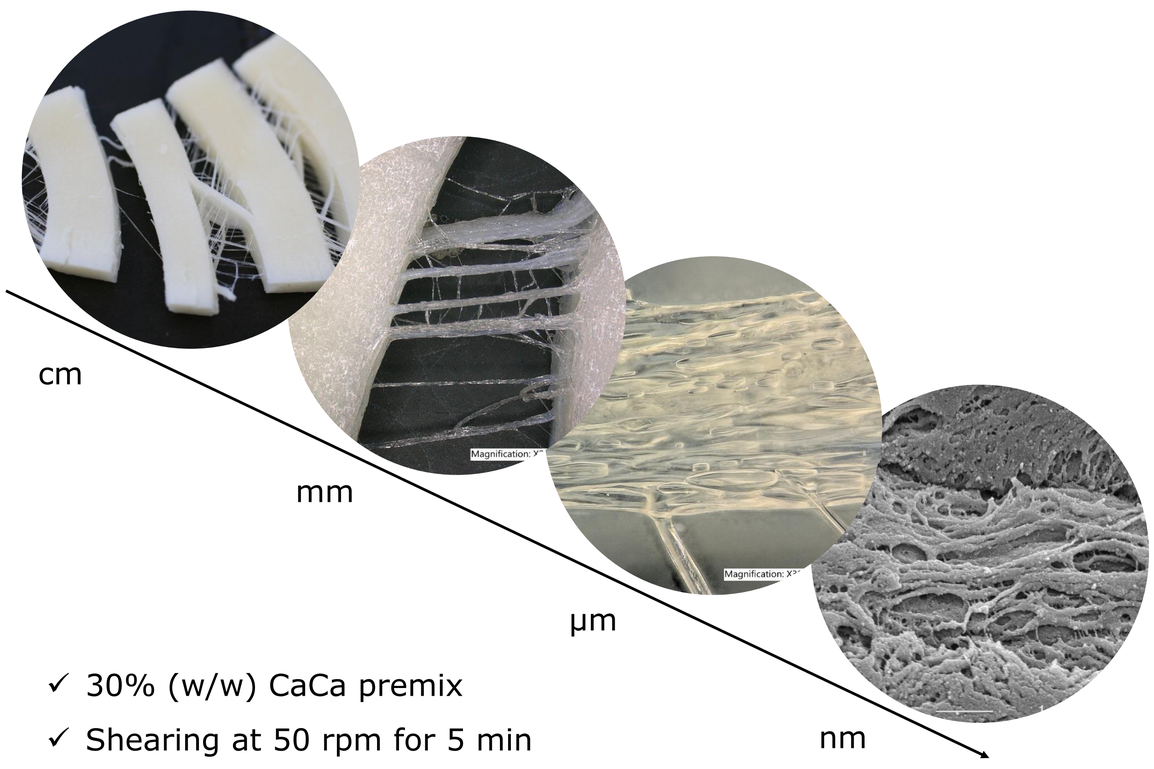
- ❑ The shearing device applies a well-defined deformation to the material.





Results

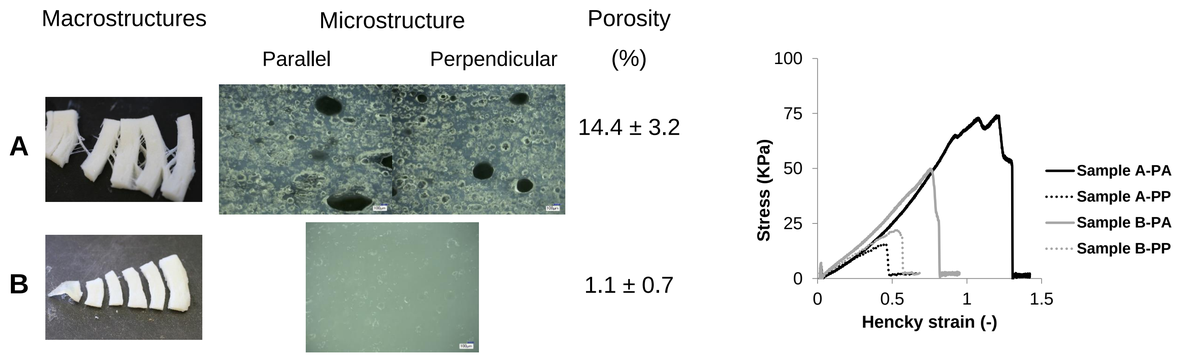
- ❑ Shear induced fibrous structure with different length scales without Tgase-induced crosslinking.
- ❑ Air incorporated in the CaCa matrix with microscale.



- ✓ 30% (w/w) CaCa premix
- ✓ Shearing at 50 rpm for 5 min

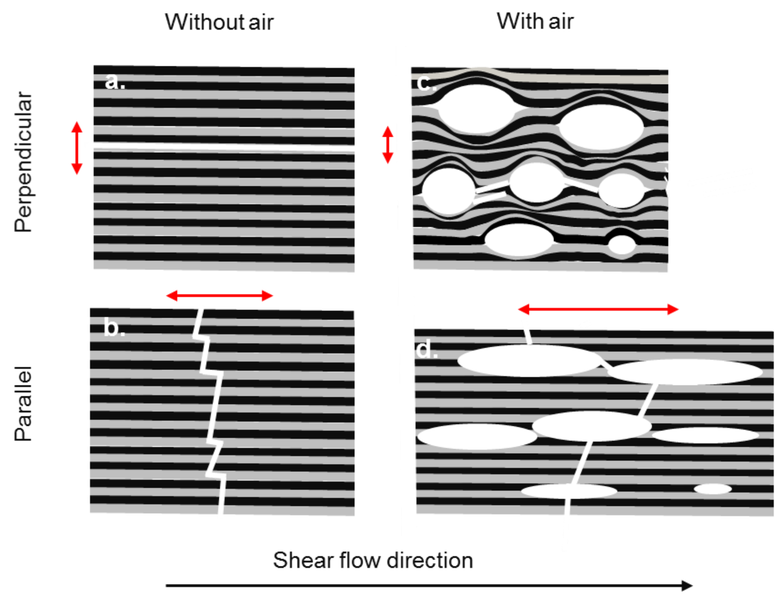
Results

- ❑ Sheared CaCa premix with air bubbles showed pronounced fibrous character.
- ❑ The air bubbles were elongated in the direction parallel to shear flow
- ❑ Air incorporation in the fibrous material increased the mechanical anisotropy.



Discussion

- ❑ Air bubbles result in brittle fracture in the perpendicular direction due to crack propagation
- ❑ Air bubbles act as a crack-stopper that results in ductile fracture in the parallel direction.



Conclusions

- Fibrous material is created in the absence of Tgase-induced crosslinking with different length scale.
- Air incorporation result in fibrousness appearance.
- Air incorporation enhances the anisotropy of sheared CaCa materials.
- Air bubble acts as a crack-stopper in the parallel direction.

Acknowledgements

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