Shear-induced structuring to form protein based fibrous matter

Constantinos V. Nikiforidis, Atze Jan van der Goot

Potential use of protein fibrous materials? → Meat analogues

Meat consumption is not sustainable:

- 70% of annual grain crop to produce meat (US)
- App. 150 bn kg grain as feed → 20 bn kg meat products
- Water requirement compared to wheat
  - 100 x more water
  - App. 10 x more fertilizers and pesticides (based on 10 kg wheat per kg meat)
- 1 kg methane for every 3 kg meat produced (World Watch Institute)

Alternative: Fibrous plant based products

Current production methods of meat analogues:

- Extrusion
- Alginate technology
  - CaCl₂ addition upon mixing
- Methods based on mixing process
- Making structures is not mixing

Shear induced structuring – Fibrous macrostructure

Directed self-assembly

CaCas micellar suspension

Alignment under shear

Solidification at rest

Solidification

No solidification

Shear-induced structuring is a promising method to make anisotropic and fibrous materials from dairy and plant proteins

The flow type is important rather than the geometry of the device

Cone-cone device + rheology: understanding the role of ingredients and process condition in the structure formation

Neutron Scattering probably a useful tool to characterize the molecular interactions

Conclusions