

IMAGE ANALYSIS ON BIOPOLYMER NETWORKS

CHARACTERIZATION USING GRAPHS

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1. Intro: Biopolymers in the meso-scale
2. Gathering structure data: Experiments.
3. Image Analysis
4. Graph Characterization
5. Conclusion

INTRO: BIOPOLYMERS IN THE MESO- SCALE

[Storm et al., 2005]

STRAIN-STIFFENING: VALIDITY OF AFFINE DEFORMATION APPROXIMATION

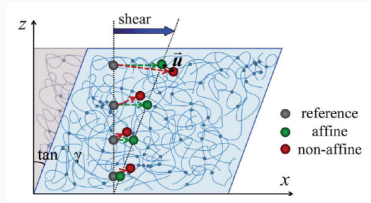
[Wilhelm and Frey, 2003] [Onck et al., 2005]

Affine transformations valid at:

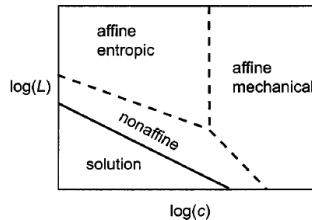
- Stiff Components
- Dense Networks

Non-Affine at:

- Compliant Components
- Coarse Networks



[Wen et al., 2012; Basu et al., 2011]



GOALS AND RESEARCH QUESTIONS

- Biopolymer gels properties are known to rely heavily on its single-chain components, but also on the way they are linked and interconnected to each other.
- Going beyond the isotropic vision of connectivity for biopolymer gels, we want to characterize the architecture of the filaments using images from different microscopy techniques depending on the scale of the biopolymer.
- How different architectures do influent the mechanical properties? Are completely different biopolymers sharing universal properties in their connectivity?

- ?, strain stiffening arises from non linearity of single chains. Under the assumption that the network is isotropic and homogeneous. What happens when the network is anisotropic, or it is partially oriented.
- ?, at the same time an alternative explanation of strain stiffening arises from network connectivity and relative orientation of the fibers.

- The power law behaviour has derived from universal slope of 1 ? to **surprisingly(?)** a slope of $3/2$. We think that this data require a further explanation beyond the assumption that collagen is somehow an exception in that universality claimed years ago.
- The shift to strain stiffening, or the beginning of a nematic phase of partially oriented fibers, might depend on architecture.

- Gathering the images. Microscopy.
- Image analysis. Skeletonization.
- Characterize the image. Graph approach.

GATHERING STRUCTURE DATA: EXPER- IMENTS.

Confocal

- Milk
- Eggs
- Potatos

TEM

1. First,
2. Second and
3. Last.

SAXS

PowerPoint Meeh.

Beamer Yeeeha.

IMAGE ANALYSIS

Some references to showcase [allowframebreaks] ?????

GRAPH CHARACTERIZATION

CONCLUSION

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QUESTIONS?

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