

MICROSTRUCTURE AND YIELDING OF MICROFIBER GELS

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Large aspect ratio cellulose nanofibers are able to form a porous network at low volume fractions via aggregation and entanglement, forming a gel without significantly modifying viscosity[1]. The gels have a small but useful yield stress and a better ability to suspend particles than non-interacting higher volume fraction glasses[2] because the sparse fiber networks can significantly restructure at small strains. Yielding behavior can thus strongly depend on the fluid microstructure[3].

We study here deformation and yielding of aqueous cellulose fiber gels. Confocal imaging shows how gel yield stress relates to structural deformation rate because of localized network restructuring. Such response is advantageous to applications like surface coatings, nasal sprays, cosmetics, and foods. Understanding the mechanism of rate- and length-scale dependent yielding, and relating microstructure changes to bulk rheology[4], will enhance our ability to formulate, model, and design complex fluids with novel performance.

References

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