Rigid filaments with varying chirality and tunable shape

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Polymeric suspensions are traditionally classified into three categories depending on the rigidity of the filament backbone: flexible coils, semi-flexible filaments and rigid rods. Using bacterial flagella as the basic building block we describe a model system of rigid chiral filaments with two unique features. First, the flagella-based filaments are not rodlike but have a spatially varying curvature. Second, in response to applied external stimuli these filaments undergo large-scale polymorphic shape changes. We study properties of dense isotropic suspensions of such filaments. Using optical microscopy we quantify how the shape of the constituent rigid filaments affects the microscopic dynamics and relate this information to macroscopic rheological properties. Certain filaments shapes are permanently jammed at extremely low volume fractions and effective behave as cross-linked gels. Finally, we describe preliminary results in which we switch filament rheology by inducing shape changes of the constituent filaments.