

Abstract Submitted
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New rheometer geometry to characterize delicate biological fluids in-situ.¹ KELLY CONNELLY, ETHAN YOUNG, JEAN-PIERRE HUBSCHMAN, JEFF ELDREDGE, PIROUZ KAVEHPOUR, None — The vitreous humor is a viscoelastic gel-like fluid that fills and maintains the structure of the eye. Changes in the structure of the network of macromolecules in vitreous occurs naturally during aging causing pathological conditions such as retinal tears that may lead to blindness. Vitrectomy surgery is a common procedure to remove problematic vitreous from the eye, but must be carefully performed to prevent iatrogenic retinal tears. Minimizing invasiveness and surgical time depends on the viscoelastic behavior of vitreous as it flows from the eye out through a small gauge needle. Rheology has been used to correlate relevant viscoelastic fluid properties with the macromolecular structure previously using parallel plate rheometer geometries, and now with a new patented probe geometry. This improves upon plate geometries because measurements are in situ, so removal of the vitreous from the eye is not necessary. Creep rheological experiments with the probe indicate a region of elastic behavior exists at shorter timescales and steady state apparent viscosity at longer timescales. In-situ creep tests advance understanding of how macromolecular structure alters viscoelasticity, which may allow better predictions of fluid flow during vitrectomy in the future.

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