

## MEASURING THE VISCOSITY OF THE VITREOUS HUMOUR USING AN OPTICALLY TRAPPED LOCAL PROBE

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We present results demonstrating for the first time that optical tweezers can be used to measure the local viscosity of the liquid phase of the vitreous humour from a rabbit eye. The motivation behind these measurements is to gain a better understanding of the structure of the vitreous humour in order to design effective drug delivery techniques. In particular, we are interested in methods for delivering drug to the retina of the eye in order to treat sight threatening diseases such as age related macular degeneration.

Established rheology methods for measuring viscosity are not benign and often destroy the structure of the material during analysis. An optical trapping approach that monitors the characteristics of a trapped bead within the material provides an ideal tool for measuring the viscosity of the vitreous humour without destroying its structure.

By trapping micron sized polystyrene beads and utilising a viscous drag force technique we highlight a difference in the viscosity of frozen and fresh vitreous samples. Validation studies with 2%(w/w) methylcellulose solution establish this method as sufficiently accurate (7.25%) and reproducible (96.75%) for current application, with minimal damage to the sample and the use of small sample volumes.

The presentation will discuss the future plans for this project including a new sample preparation technique utilises an intact eye (see Figure 1) and a method for measuring the viscoelastic properties *in situ* of the vitreous gel phase using a fast camera to monitor the Brownian motion of a trapped bead.

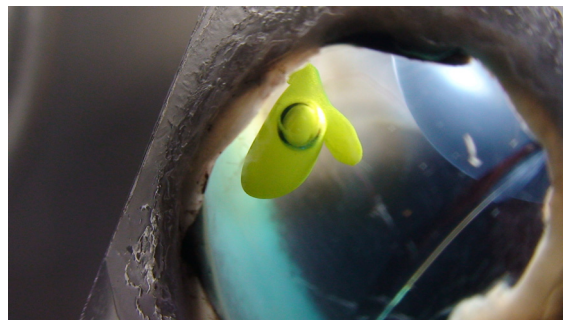


Figure 1: A “Miyake Apple” eye that has been prepared by attaching a coverslip as a window covering an incised sclera. Green fluorescent beads have been injected into the eye to use as future probes and are being excited via a blue LED placed at the corneal face.