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Intrinsic viscosity of actively swimming microalgae suspensions RANDY EWOLDT, University of Illinois at Urbana-Champaign, LUCAS CARETTA, ANWAR CHENGALA, JIAN SHENG, University of Minnesota — Suspensions of actively swimming microorganisms exhibit an effective viscosity which may depend on volume fraction, cell shape, and the nature of locomotion (e.g. "pushers" vs. "pullers"). Although several dilute-regime theories have been offered for active suspensions, no experimental study to our knowledge has been able to resolve the dilute-regime intrinsic viscosity of actively swimming microorganism suspensions. Here we use a cone-and-plate rheometer to experimentally measure the dynamic shear viscosity for motile and non-motile suspensions of unicellular green algae (Dunaliella primolecta, a biflagellated "puller"). The low viscosity biological samples require careful experimental protocols to avoid settling and flow-induced migration, and to minimize precision error. With these protocols in place we can distinguish the intrinsic viscosity which we show is higher for the motile "puller" swimmers compared to the immobilized counterparts. This observation is consistent with recently proposed dilute-regime theories which predict that "pullers" should have a higher viscosity than non-motile suspensions.

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