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Demonstration of Secondary Currents in the Pressure-Driven Flow of a Concentrated Suspension Through a Square Conduit ARUN RAMCHANDRAN, ADAM ZREHEN, University of Toronto — It has been known for several decades now that the pressure-driven flow of polymer melts in non-axisymmetric conduits is not unidirectional; the main flow through the channel is accompanied by secondary currents, whose origin can be attributed to second normal stress differences. However, only recently was it realized [Ramachandran and Leighton, *J. Fluid Mech.* (2008)] that the same may be true for concentrated suspensions, which, upon shearing, exhibit strong second normal stress differences. This work confirms the existence of these secondary flows by carrying out pressure-driven suspension flow experiments through a square (non-axisymmetric) duct. By tracking the motion of a thin stream of a contrastingly-dyed suspension introduced into the bulk flow of another, it is demonstrated that the suspension flows out of the sidewalls of the geometry towards the corners of the square cross-section, and then flows towards the center. This is found to be qualitatively consistent with calculations based on the suspension balance model of Nott and Brady [*J. Fluid Mech.* (1994)]. Secondary currents have been predicted to be the dominant mechanism determining particle distribution in suspension flows, and this work lends support to that idea.

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