Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Study of flow and particle distribution in a bifurcation using dynamic NMR Microscopy E.O. FRIDJONSSON, J.D. SEYMOUR, S.L. CODD, G.R. COKELET, MSU — The flow and distribution of Newtonian, polymeric and colloid suspension fluids at low Reynolds numbers in bifurcations has importance in a wide range of disciplines, including microvascular physiology and microfluidic devices. A bifurcation consisting of circular capillaries laser etched in a hard polymer with inlet diameter 2.64 mm, bifurcating to a small diameter outlet of 0.76 mm, and a large outlet of 1.35 mm diameter is examined using four distinct fluids (Water, 0.25 percent (w/w) Xanthan Gum, 8 and 22 percent (v/v) polydisperse oil inside core-shell latex particles) at different flow rates from 5mL/hr to 30mL/hr covering a range of Reynolds numbers based on the entry flow from 0.3 to 8. A Bruker DRX250 NMR system is used with PGSE techniques to obtain dynamic images of the fluids inside the bifurcation. Velocity in all three spatial directions is examined to determine the impact of secondary flows and characterize the transport in the bifurcation. The velocity data provides direct measurement of the volumetric distribution of the flow between the two channels. For the colloidal particle flow the distribution of colloid particles down the capillary is determined by examining the spectrally resolved propagator for the oil inside the core-shell particles in the direction perpendicular to the axial flow. Using dynamic NMR Microscopy the potential for using magnetic resonance for particle counting in a microscale bifurcation is thus demonstrated.

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Date submitted: 19 Sep 2007 Electronic form version 1.4