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Time Dependent Drag Reduction by Long Chain Polymers in Taylor-Couette Flow DANIEL D. LANTERMAN, IREAP, Dept. of Physics, University of Maryland, College Park 20740, MATHEW FERGUSON , IREAP, Dept. of Physics, University of Maryland, College Park 20740, National Institute of Health, Bethesda Maryland 20892, DANIEL P. LATHROP, IREAP, Dept. of Physics, University of Maryland, College Park 20740 — The addition of small amounts of long chain polymers has been shown to dramatically reduce the drag in some aqueous turbulent flows. We examined this effect in flow between concentric rotating cylinders (Taylor-Couette flow). The apparatus is instrumented to measure torque on the inner cylinder and can achieve Reynolds numbers up to $Re = 1.4 \cdot 10^6$. Reductions in drag of up to 47% are seen immediately after the addition of the polymer (typical concentrations 10-20 ppm), but this value decays over a time scale of tens of minutes. While the scission of individual polymer molecules may also be important, light scattering measurements, performed on liquid samples, suggest the formation of entangled aggregates of polymer molecules. The polymers used are polyacrylamide with mean molecular weights of 5.5 and 18 MDaltons. Tested concentrations range from 0.5 to 100 parts per million by mass. We examine the dependence on concentration and shear rate (Reynolds number).

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