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**Probing the Miscibility Phase Space of Two Nanochannel-Confined DNA Molecules** AHMED KHORSHID, WALTER REISNER, McGill University — While small identical particles always mix in equilibrium, self-avoiding polymers under transverse confinement can segregate or demix as a fundamental consequence of chain interconnectivity and entropy maximization. Demixing arises as mixed polymer conformations in confinement have a higher excluded-volume, and thus lower entropy, than non-mixed conformations. A wide range of simulation/scaling efforts have quantified the detailed segregation-mixing phase space for two confined chains, yet there are no quantitative experiments on two-polymer mixing in confinement. Here we use pneumatically actuated hydrodynamic flow to compress two differentially labeled nanochannel confined DNA molecules against dead-end nanoslit barriers. The differential labeling enables us to quantify separately the dynamic concentration profiles of each chain along the channel enabling precise determination of the degree of chain overlap. For 300x300 nm channels, we find that chains will resist mixing at low applied flow. At intermediate flow speeds, the two chains will partially overlap. At sufficiently high flow speeds the two chains fully mix. In addition, for smaller channels (200x200nm), the maximum chain overlap will decrease in comparison to wider channels with the two chains never fully overlapping.

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