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Mixing of Fluids in Nanochannels ERIC OLIVER, GARY W. SLATER, University of Ottawa — We report on numerical simulations of fluid mixing in nanochannels with widths on the order of (or less than) 30 nanometers. Previous work in this field has concentrated on modelling the system with the macroscopic equations of fluid dynamics; however, onsuch length scales considered here a continuum approximation may no longer be valid. We address this issue by resorting to a Molecular Dynamics model where we explicitly include two solvents. The scale of our channels and the forces involved implies a very low Reynolds number and hence, the flow is laminar and we must rely on diffusion to mix the fluids. By patterning the walls of the channel such that, mimicking a chemical pattern, they repel or attract different species of the unmixed fluids or by physically modifying the geometry of the channel we can overcome the limitations of very slow diffusive mixing. These modifications disrupt the laminar flow profiles, thus introducing a mechanism that can accelerate mixing in much the same way that turbulence does in non-laminar flow. The simulations performed have allowed us to follow the mixing molecule by molecule, thus providing us with a complete picture of the mixing process.

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