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Effect of Flow-Induced Molecular Alignment on Welding of Polymer Interfaces[1] MARCO GALVANI, THOMAS O'CONNOR, MARK ROBBINS, Johns Hopkins University — Additive manufacturing, a process of successive deposition of layers of polymer used to synthesize objects, is quickly developing into an effective method of creating polymer-based materials. The physical properties of materials produced by additive manufacturing depend strongly on the mechanics of welded interfaces where polymer chains diffuse between contacting layers. The degree of interdiffusion and the resulting entanglement structure are the dominant factors that give rise to the interfacial strength. In this project, we use large molecular dynamics simulations to examine how flow-induced molecular alignment from the deposition process affects weld formation and strength. First the relation between alignment and entanglement loss is studied for model polymers of different entanglement lengths. Then the effect on the rate of interdiffusion is determined and the formation of interfacial entanglements is correlated to the rate of increase in interfacial strength towards the bulk value.

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