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A two-scale-two-mode dynamic self-consistent theory of entangled interfaces in polymer fluids under flow. YITZHAK SHNIDMAN, ISMAEL YACOUBOU-DJIMA, College of Staten Island, City University of New York — Tracking conformation statistics on the Kuhn scale is essential for modeling interfacial phenomena in polymer fluids under flow. Successive entanglements partition entangled chains into strands that are in one of two modes: entangled or dangling. Strands follow different differential evolution equations for the second moment of their end-to-end distance, depending on their mode. Dangling strands are governed by the FENE-P equation. For entangled strands, a different evolution equation was proposed by G. Marrucci and G. Ianniruberto, *Phil. Trans. R. Soc. Lond. A* **361**, 677 (2003). On the Kuhn scale, strand's conformation statistics is sampled by random walks in an effective potential, which are regulated by the evolving second moment of its end-to-end distance. Conformation statistics of a dangling strand is adequately modeled by Wiener (uncorrelated) random walks, but stretching of entangled strands under flow induce correlations between successive steps requiring a persistent random walk model (I. Yacoubou-Djima and Y. Shnidman, http://arxiv.org/abs/0708.2679v1). A two-scale-two-mode subchain propagation scheme, starting from free segments evolved by a probabilistic transport equation, allows a self-consistent calculation of evolving interfacial structure and rheology.

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