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Matched high-De expansions of the Hookean dumbbell configuration tensor downstream of neutral stagnation points MICHAEL J. BROWN, ENRIQUE GEFFROY, Department of Rheology, Materials Research Institute, National Autonomous University of Mexico, Mexico City — In steady flow at high Deborah number, one may specify a regular asymptotic expansion of the Hookean dumbbell configuration tensor provided a high-De solution exists upstream. However, downstream of neutral stagnation points, where the strain rate is either zero or negated by vorticity, this expansion is singular despite the existence of a solution at the stagnation point. Following the work of M. Renardy (JNNFM, 90, 13-23), we present a method for obtaining an inner expansion in the boundary layer downstream of neutral stagnation points where affine deformation is checked by dumbbell recoil at leading order. A generic outer expansion may then be matched to this inner expansion to obtain a composite solution. We consider two such matched expansions in the limit of infinite dilution where the flow is Newtonian: 1.) on the centerline downstream of an immobile rigid sphere in axisymmetric flow and 2.) on the separating streamline around a freely-mobile circle in shear flow.

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