Suspension flow modeling for general geometries

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A frame-invariant model for the flow of concentrated dispersions is developed. This model develops the nonlinear rheology of the suspension and relates it to the migration of the particles and fluid. The relation to nonequilibrium osmotic pressure concepts will be discussed to provide insight to the fundamental basis for unique suspension behavior. Application of the model to geometries including abrupt contractions or expansions, eccentric cylinder flow, and flow in and past a cavity illustrate the predictions made. These are generally in agreement with existing data but point to the need for more detailed experimentally-based understanding of the flow of dispersions in complex geometries. Experimental consideration of flow past immersed bodies illustrates the key importance of stagnation point, corner flows, and closed streamline regions, and the status of these issues in flow of suspensions will be discussed in terms of the present model status. The implementation of the modeling approach into a purpose-built flow solver as well as a commercial flow solver will be illustrated to indicate the relative ease of the approach.