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A Computational Analysis of Binary Collisions of shear-thinning Droplets CHRISTIAN FOCKE, DIETER BOTHE, Technical University Darmstadt — We investigate binary droplet collisions as a prototype sub-process inside sprays and focus on shear-thinning liquids. To understand the influence of the non-Newtonian fluid rheology on the flow inside the colliding drops as well as on the collision complex dynamics, we employ direct numerical simulations based on an extended Volume of Fluid method. During collisions, extremely thin fluid lamellas appear due to the shear-thinning behavior. These have to be accounted for in a physically sound simulation and we apply a stabilizing boundary condition to be able to keep the lamella from rupturing. The results give a quantitative prediction of the resulting droplet collision complex diameter. The simulations show that in all considered cases an effective constant viscosity can be found a posteriori which leads to the same collision dynamics. But this effective viscosity is neither the mean nor the minimum viscosity. If the collision complex becomes large enough, disturbances on the rim develop during the contraction phase, which arise from the Plateau-Rayleigh instability.

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