Viscosity effects on liquid-liquid dispersion in laminar flows

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Résumé en anglais	Efficiency of liquid/liquid dispersion is an important stake in numerous sectors, such as the chemical, food, cosmetic and environmental industries. In the present study, dispersion is achieved in an open-loop reactor consisting of simple curved pipes, either helically coiled or chaotically twisted. In both configurations, we investigate the drop breakup process of two immiscible fluids (W/O) and especially the effect of the continuous phase viscosity, which is varied by addition of different fractions of butanol in the native sunflower oil. The global Reynolds numbers vary between 40 and 240, so that the flow remains laminar while the Dean roll-cells in the bends develop significantly. Different fractions of butanol are added to the oil in each case to examine the influence of the continuous phase viscosity on the drop size distribution of the dispersed phase (water). When the butanol fraction is decreased, the dispersion process is intensified and smaller drops are created. The Sauter mean diameters obtained in the chaotic twisted pipe are compared with those in a helically coiled pipe flow. The results show that chaotic advection intensifies the droplet breakup till 20% in droplet size reduction, and also reduces polydispersity.
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