Flow and mixing characteristics of Newtonian and non-Newtonian fluids in a static mixer

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Mixing is a core unit operation that determines the process performance of various chemical industries such as petrochemicals, water treatment, food processing, and pharmaceuticals. In this study, computational fluid dynamics (CFD) simulations were employed to analyze the flow and mixing characteristics in a barrier-embedded partitioned pipe mixer (BPPM). As the fluid element was stretched and divided by the slanted barriers, a chaotic advection was induced even in a creeping flow regime. In a non-creeping regime, the rotational fluid motion was enhanced which generated complex influences on the mixing performance. Recently, a structure-kinetics model was employed to describe the mixing characteristics of a thixotropic fluid in a static mixer. Our numerical studies will provide a fundamental understanding of mixing operations for the optimization of various solution processes.