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Experimental and computational fluid dynamic studies of mixing for complex oral health products MARTI CORTADA GARCIA, LUCA MAZZEI, PANAGIOTA ANGELI, Department of Chemical Engineering, University College London, Torrington Place, London, WC1E 7JE — Mixing high viscous non-Newtonian fluids is common in the consumer health industry. Sometimes this process is empirical and involves many pilot plants trials which are product specific. The first step to study the mixing process is to build on knowledge on the rheology of the fluids involved. In this research a systematic approach is used to validate the rheology of two liquids: glycerol and a gel formed by polyethylene glycol and carbopol. Initially, the constitutive equation is determined which relates the viscosity of the fluids with temperature, shear rate, and concentration. The key variable for the validation is the power required for mixing, which can be obtained both from CFD and experimentally using a stirred tank and impeller of well-defined geometries at different impeller speeds. A good agreement between the two values indicates a successful validation of the rheology and allows the CFD model to be used for the study of mixing in the complex vessel geometries and increased sizes encountered during scale up.

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