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Study of L-L water-in-oil dispersions generated in SMX-Plus static mixers with dissolved CO_2 under high pressure

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Abstract. The quantification of the mixing performance in static mixers has been object of investigation in the recent decades. However its effectiveness under elevated pressure remains still unknown. In order to increase the understanding of dispersive mixing in the presence of CO_2, a high pressure view chamber is designed; it enables the use of visualisation techniques, such as shadowgraphy. Due to the similarity between the flow through the channels of SMX-plus mixers and porous media, their characteristic pore dimensions are determined via pressure drop measurements. The suitability of carbon dioxide (CO_2) as dispersion promoter in liquid-liquid (water-in-oil) dispersions is explained as a result of its concentration in the mixture. Finally, an empirical model based on dimensionless numbers (Reynolds and Weber), allows the prediction of the maximum droplet diameter and mean Sauter diameter, which accounts for the change in physical properties provoked by the dissolution of CO_2 in the continuous oily phase.

K**ey words**: static mixer; water-in-oil dispersion; carbon dioxide; droplet breakup; shadowgraphy