

Investigations on single and multiphase mass transfer of iodine in miniaturized equipment using micro-computed tomography

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Introduction

To gain a deeper understanding of the process of mass transfer in miniaturized equipment non-invasive measurement techniques are desired. Micro-computed tomography is a non-invasive 3D imaging technique based on the attenuation of X-rays that allows investigations on the submicron range. The attenuation of X-rays is material-specific and relies mainly on density and atomic number of the sample material. Due to its high density and high atomic number iodine is a suitable element to use as the transferring component in X-ray based mass transfer experiment.

Experimental set up

Experiments are carried out using the Bruker Skyscan 1275, a micro computer tomograph with spatial resolution up to 4 μm . Single-phase time resolved mass transfer of I_2 in different liquids (water, silicone oil, ethanol) was investigated in 2D. The CT is equipped with hoses for liquid supply and liquid removal (Figure 1a), which allows for the investigation of the flow situation. Some progress has been made to visualize the stationary mass transfer from an organic phase to an aqueous phase in 3D. Therefore, a simple coflowing configuration was used to generate an annular flow (Figure 1b). The resulting flow can be seen in Figure 1c. Furthermore, concentration profiles of iodine in two-phase flow were investigated.

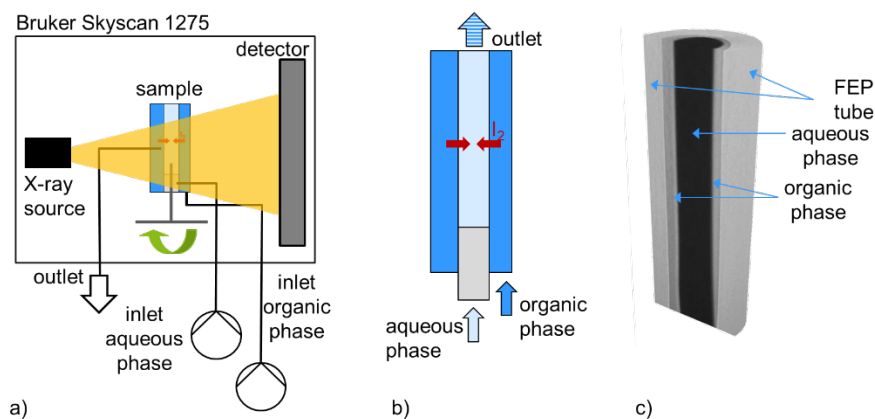


Figure 1: a) Schematic of the experimental setup for the investigation of flows using microCT, b) Schematic of the coflowing configuration, c) Resulting 3D representation of an annular flow.