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ZENTRIFUGALEXTRAKTION MIT AXIALER PHASENFUEHRUNG

ABHANDLUNG

zur Erlangung des Titels eines
Doktors der Technischen Wissenschaften
der

EIDGENOESSISCHEN TECHNISCHEN HOCHSCHULE ZUERICH

vorgelegt von

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Summary

A centrifugal extractor for liquid/liquid extraction is described in which a new principle is used. The two phases flow countercurrently in layers along the column wall and are mixed by agitators located on a separately driven central shaft rotating at a different speed to that of the wall. Coalescence of drops between the mixing zones is enhanced by the presence of special plates.

A pilot-scale column working on this principle has been designed and constructed. Mathematical models, based on the differential countercurrent flow of the phases have been developed to describe the operation and scale-up of the column. The radial and axial flow of single drops is considered, taking the boundary conditions into account.

The experimental part of the work describes mass transfer experiments performed with different geometrical arrangements of the agitators and coalescing sections. At the same time the drop formation and the radial flow of the dispersed phase in the centrifugal field was observed in a plexi-glass column of larger cross-section but shorter in length than the stainless steel column. The operating characteristics of the latter centrifuge, including the influence of backmixing and energy consumption were investigated. The pilot scale column (diameter: 94mm) contained 5 stages with an efficiency of up to 60% over a wide range of throughput, the maximum being 640 lit./h .

Further experiments have been carried out with a system of very small density difference and interfacial tension, which demonstrate that it is possible to operate the column under difficult conditions.