

CE 630

Solid-liquid extraction



Learning objectives/experiments

- fundamentals of solid-liquid extraction
- demonstration of solid-liquid extraction as a continuous and discontinuous process
- investigation of 1-, 2- and 3-stage processes
- influence of solvent flow rate and temperature on the extraction process
- influence of extraction material feed rate and extractor revolving speed on the extraction process

Description

- **discontinuous and continuous solid-liquid extraction**
- **1-, 2- or 3-stage modes possible**
- **regenerable extraction material**
- **GUNT software with control functions and data acquisition**

The CE 630 allows a soluble component of a solid mixture to be extracted with a revolving extractor.

In continuous 3-stage mode, pure solvent (distilled water) is delivered from a tank to the sprinkler of the first extraction stage where it is distributed over the solid mixture (extraction material). The solvent seeps through the extraction material, absorbs its soluble components (potassium hydrogen carbonate) and passes into the collecting segments.

From there, the enriched solvent is delivered to the sprinkler of the next stage. After passing through the last stage, the extract (the solvent charged with the extracted component) is collected in the extract tank. The extraction material is continuously fed into the cells of the rotating extractor by a spiral conveyor. The extraction material and the solvent move in counterflow. The extraction residue drops into a tank after one revolution of the extractor.

Valves can be used to switch to 1- or 2-stage continuous mode. Discontinuous mode is possible with the extractor stopped.

Three pumps are available for delivering the solvent. Their speed can be individually adjusted for each stage. The temperature of the solvent can likewise be adjusted for each stage with PID controllers. Each stage is equipped with conductivity sensors to monitor the separation process. All measured values can be viewed by software.

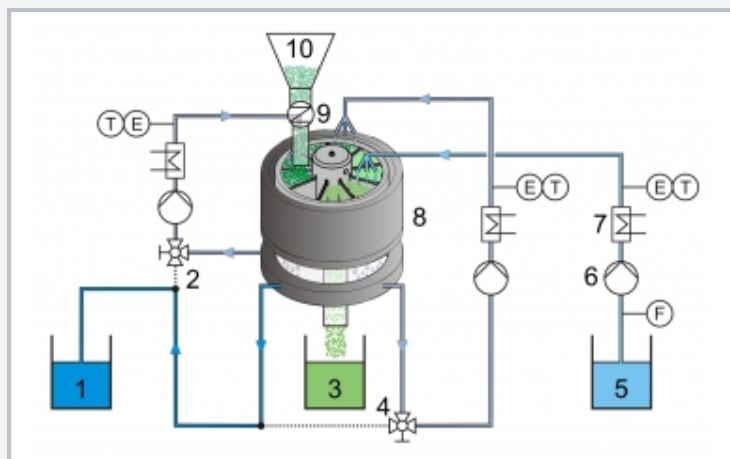
The solid mixture (extraction material) is produced prior to the extraction experiment. The carrier material (granular aluminium oxide) is fed into a salt solution (potassium hydrogen carbonate dissolved in water). The carrier material soaked with the salt solution is then dried.

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1 process schematic, 2 spiral conveyor for extraction material, 3 revolving extractor, 4 revolving extractor drive unit, 5 pump (behind the tanks), 6 tank, 7 mode selector valves, 8 heater and solvent feed, 9 switch cabinet with controls



1 extract, 2 connection for 2-stage mode, 3 extraction residue, 4 connection for single-stage mode, 5 solvent, 6 pump, 7 heater, 8 revolving extractor, 9 spiral conveyor, 10 extraction material; T temperature, E conductivity, F flow rate

Specification

- [1] revolving extractor for continuous and discontinuous solid-liquid extraction
- [2] switching to 1-, 2- or 3-stage modes possible by valves
- [3] extractor revolving speed adjustable by potentiometer
- [4] spiral conveyor with variable speed to adjust the extraction material feed rate
- [5] flow rate of solvent adjustable for each stage via speed of pumps
- [6] temperature of solvent adjustable for each stage by PID controller
- [7] tanks for extraction material, extraction residue, solvent and extract
- [8] GUNT software for data acquisition via USB under Windows 7, 8.1, 10

Technical data

Extractor

- 9 cells
- rotor diameter: approx. 200mm
- speed: approx. 0...9h⁻¹
- motor power consumption: approx. 0,9W

Spiral conveyor

- max. feed rate: approx. 20L/h
- motor power consumption: approx. 4W
- 4 peristaltic pumps
- max. flow rate: approx. 25L/h at 300min⁻¹ and hose 4,8x1,6mm

3 heaters

- power consumption: approx. 330W

Tanks

- extraction material: approx. 5L
- extraction residue, solvent, extract: each approx. 20L

Measuring ranges

- flow rate: 1x 0,025...0,5L/min
- conductivity: 4x 0...20mS/cm
- temperature: 4x 0...50°C

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase; 120V, 60Hz, 1 phase

UL/CSA optional

LxWxH: 1360x780x1900mm

Weight: approx. 150kg

Required for operation

PC with Windows recommended

Scope of delivery

- 1 trainer
- 1 set of tools
- 1 packing unit of aluminium oxide
- 1 packing unit of potassium hydrogen carbonate
- 1 GUNT software CD + USB cable
- 1 set of instructional material