

CE 100

Tubular reactor



Description

- tubular reactor in water bath with temperature control
- preheating of the reactants possible
- determination of the conversion in a saponification reaction

Tubular reactors are continuously operated reactors. They enable economic production of large product quantities with a consistent quality.

The core element of CE 100 is a helical plastic tube. Two pumps convey the reactants separately into the reactor from two tanks. Two coiled tubes located in a water bath preheat the reactants. After preheating, each of the reactants flows through a nozzle. The nozzle outlets are located in a T-piece in such a way that the two reactants are mixed in the centre of the T-piece. The mixture enters into the tube in which the two reactants react. The mixture of products and unconverted reactants leaves the tube and is collected in a tank.

The flow rates, and thus the retention time of the reactants in the tubular reactor, are adjusted via valves and displayed on flow meters. The flow tube is located in the water bath together with the two coiled tubes. The water bath is heated by a controlled heater. The controller on the switch cabinet serves to set the desired temperature and indicates the current temperature of the water bath. An overflow and connections for cooling the water bath via an external water supply are provided. A stirrer ensures an even temperature distribution in the water bath.

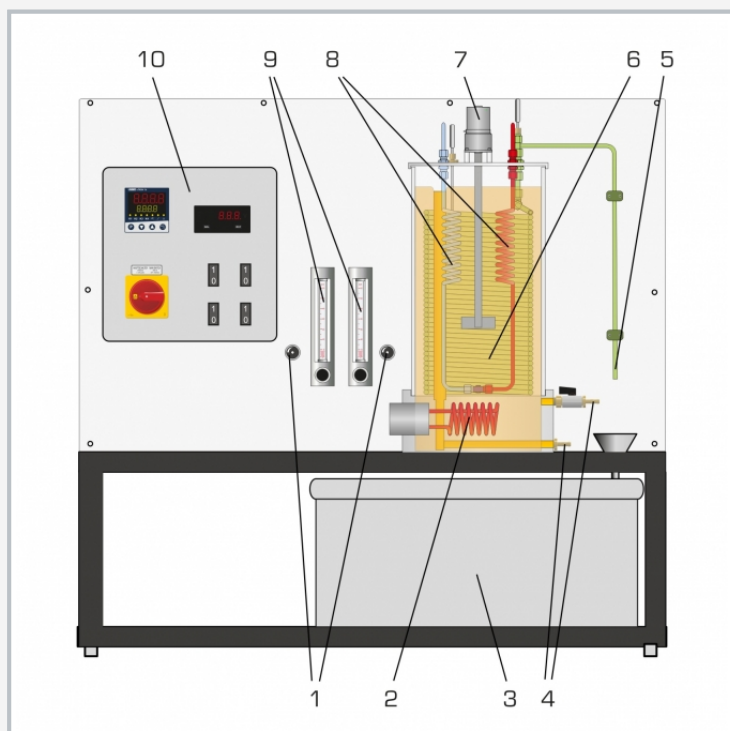
The conversion in the tubular reactor is determined by measuring the conductivity. Samples can be taken at the end of the tube for this purpose. A sensor records the temperature at the outlet of the tube. The temperature is displayed on the switch cabinet.

Learning objectives/experiments

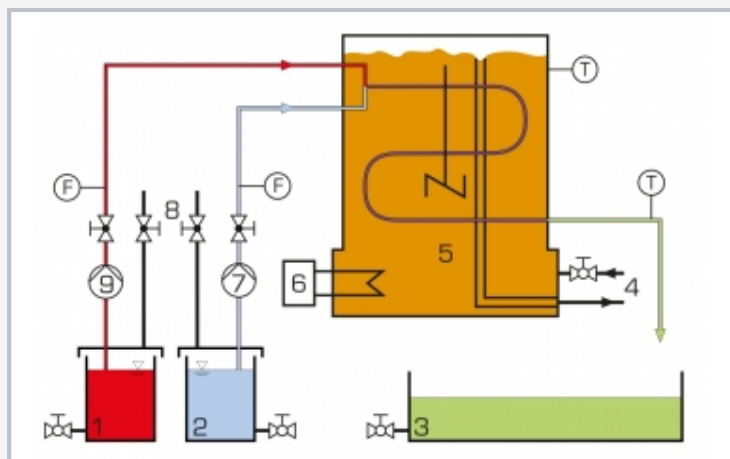
- fundamentals of a saponification reaction
- conversion
 - ▶ depending on retention time
 - ▶ depending on the temperature

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Tubular reactor



1 valves for aeration of the reactant tanks, 2 heater, 3 product tank, 4 connection for cooling the reactor, 5 product outlet, 6 tube, 7 stirrer, 8 preheating of the reactants, 9 reactant flow meters, 10 switch cabinet



1 reactant A, 2 reactant B, 3 product, 4 connections for cooling of the reactor, 5 tubular reactor, 6 heater, 7 pump for reactant B, 8 valves for aeration of the reactant tanks, 9 pump for reactant A; F flow rate, T temperature

Specification

- [1] continuous tubular reactor for performing a saponification reaction
- [2] helical plastic tube as reactor
- [3] 2 identical pumps to convey the reactants
- [4] separate adjustment of the reactant flow rates via valves
- [5] 2 helical stainless steel tubes for preheating the reactants
- [6] T-piece with 2 nozzles for mixing the preheated reactants
- [7] transparent PMMA tank with heater and stirrer as water bath for the reactor and for preheating
- [8] controller for adjusting the temperature of the water bath
- [9] 2 tanks for reactants, 1 tank for products and 1 tank for cleaning fluid
- [10] measuring of flow rate and temperature

Technical data

Tubular reactor

- inside diameter: approx. 5,5mm
- reactor capacity: approx. 480mL
- material: PA

Reactant pumps

- max. flow rate: each 300mL/min
- max. head: each 10m

Water bath

- inside diameter: approx. 200mm
- capacity: approx. 6L
- material: PMMA

Speed of stirrer: max. 135min⁻¹

Heater

- power consumption: approx. 3kW

Tanks

- reactants: 2x 20L
- cleaning liquid: 1x 20L
- products: 1x 50L

Measuring ranges

- flow rate: 2x 20...340mL/min
- temperature: 2x 0...80°C

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase; 230V, 60Hz, 3 phases

UL/CSA optional

LxWxH: 1200x600x1050mm, Weight: approx. 110kg

Required for operation

Conductivity meter, balance, ethyl acetate, caustic soda (for saponification reaction)

Scope of delivery

- 1 experimental unit
- 2 hoses, 1 valve for cleaning, 1 funnel
- 1 set of instructional material