Features

Tesca introduces students to the fundamentals of packed bed catalytic reactors. It is a bench-top unit available with either two or three reactor columns. Using two columns with a chemical catalyst allows a different particle size exchange resin to be used in order to study the effect of particle size on reactor kinetics. It is possible to use a third column to investigate biological catalysis, using the enzyme invertase, and compare this with chemical catalysis.

An optional flow injection analysis (FIA) module is available. This module is positioned on the CEU plinth and provides an easy on-line measurement of product yield, eliminating the need for manual assays. The module is also useful for teaching the FIA technique and demonstrating the advantages of this measurement method in continuous processes.

The recommended reaction is the inversion of sucrose to form glucose and fructose. This is a safe and environmentally friendly reaction.

An optical absorbance sensor is provided to monitor the status of the reaction. With the basic system, samples are taken manually and inserted into the absorbance sensor using sample tubes. A variable speed peristaltic feed pump controls the flow rate through the reactors. Valves are provided to change the feed and product flow from one column to the other quickly and easily. This allows the student to investigate different reaction systems without having to dismantle the equipment and re-pack the columns. Optional DAQ software interface can be provided for tabulating and recording of the readings.

Experimental Capabilities:

- Understanding the principles of packed bed catalytic reactors
- Mass balancing
- Examination of steady and unsteady state catalysis
- Comparison of chemical and biological (enzymic) catalysis
- Flow Characterization in a packed bed
- Understanding the principles of Flow Injection Analysis (FIA)
- Determination of steady state and unsteady state kinetics of a packed bed catalytic reactor.
- Performance comparison of a chemical catalyst (protonated cationic exchange resin) with a biological catalyst (Characterise enzyme).
- Effect of catalyst particle size on the Thiele modulus and the effectiveness factor (quantification of the competitive effects that occur between reaction kinetics and mass transfer inside the catalytic particle).
- Effect of flow rate, temperature and feed concentration on steady state conversion.
- Tracer studies to Characterise fluid flow within the reactors.
- Demonstration of the Flow Injection Analysis technique.
- Examination of the reproducibility and sensitivity of the FIA analysis method as a function of the flow rate and sample concentration.

Specifications

- A bench top unit comprising a vacuum formed ABS plastic plinth with integral electrical console on to which is mounted the packed bed reactor columns, feed pump, optical sensor and optional Flow Injection Analysis (FIA)

Note: Specifications are subject to change.

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system.

- The unit is supplied as standard with two reactor columns, of size 50mm dia x 160mmL, for chemical catalysis. A third column can be optionally added to the system for biological (enzymic) catalysis.
- A heated water supply to the column jackets allows automatic control of reaction temperature to a set point value. Feed flow rate can be varied between 0 and 15 ml/min.
- Spectro-photometric assay is used to determine the degree of conversion via optical sensor.
- The optional FIA pump can be adjusted to give flow rates up to 2.5 ml/min.
- All electrical circuits are protected by appropriate protection devices.
- The console has two digital meters. The first, associated with the controller, shows the temperature of water supplied to the column jackets, and the second shows the optical sensor reading which provides a measure of product concentration.
- Optionally corresponding signals are routed to the I/O port for connection to a PC.

Dimensions

- Height 600mm X Width 1000 X Depth 500mm
- Weight: @ 45 Kgs

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