



UNIVERSITÀ DEGLI STUDI DELL'AQUILA

CORSI DI INGEGNERIA

A.A. 2017/2018

Reattori Chimici (I4H)

- Foscolo Pier Ugo -

(Aggiornato il 28-08-2017)

Contenuti del corso (abstract del programma):

At the end of the course the students should be able to understand the importance of fluid-dynamics in designing real reactors with major consideration of the influence of mass transfer on the overall kinetics (final conversion and yield) in multiphase reactors. Simplified approaches will be also considered to take decisions on the modeling choices to finalize the reactor design. Taking advantage of various numerical exercises, the students will be able to apply the concepts acquired to the industrial reactor design. The students will also gain the ability to evaluate the importance of employing different chemical reactors for the selectivity of the chemical processes, for the energetic efficiency, and for environmental impact.

Programma esteso:

Reattori Chimici SSD: ING-IND/24 9 CFU Docente: Prof. Pier Ugo Foscolo Laurea Magistrale in: Ingegneria Chimica Contenuti principali: Homogeneous reactors: definition of the reaction rate ? molar conversion ? balance equations utilized for reactor sizing ? Damkoehler number ? ideal reactors, continuous (tubular and stirred tank) and batch in isothermal operating conditions. multiple ideal reactors to model and design real reactors (residence time distribution functions are dealt with in a different course unit) ? methodologies for kinetic analysis and evaluation of kinetic parameters ? multiple reaction systems: series and parallel reactions, a generalised standard method to evaluate the performance of multiple reactions systems ? complex kinetic expressions. Design of non isothermal reacting systems in continuous and batch operating conditions. Runaway exothermic reacting systems and safety measures. Heterogeneous reactors: mass transfer coupled with chemical kinetics ? external mass transfer (resistances in series) and internal diffusion (reaction efficiency and diffusion enhancement concepts). Shrinking core model. Analysis of gas/solid catalytic systems and gas/liquid and gas/liquid/solid reacting systems. Fixed bed reactors. Elements of fluidization: two phase theory of fluidization ? fluidized bed chemical reactor models.

Modalità d'esame:

Oral exam, including discussion of a short report prepared by the student on 2 lab demonstrations and 1 reactor sizing numerical exercise

Risultati d'apprendimento previsti:

On successful completion of this module, the student should: - have extensive knowledge of homogeneous and heterogeneous reacting systems - applying knowledge and understanding to sizing of homogeneous and heterogeneous chemical reactors. - making informed judgements on process alternative layouts and control policies of chemical reactors - demonstrate skill in reactor design and ability to operate them, - demonstrate capacity to continue learning from scientific literature on chemical reaction engineering and related topics.

Testi di riferimento:

H. Scott Fogler Chemical Reaction Engineering

Dispense fornite dal docente

Advanced Biomass Gasification: new concepts for efficiency increase and product flexibility S. Heidenreich, M. Mueller, P.U. Foscato Academic Press, 2016