Mass transfer

Introducing

Description

Thermodynamic properties of gas/liquid equilibria in the perfect gas state, concepts of fugacity and Henry's equilibrium. Transfer properties (viscosity, thermal conductivity, diffusivity) and phase equilibria of multi-constituent real fluids.
Introduction to matter transfer: establishment of the continuity equation, resolution of this equation in a few special cases. Introduction to the notion of transfer coefficient, dimensional analysis, transfer models (film and double film), experimental determination of transfer coefficient, concept of Height of Transfer Unit (HUT) and Number of Transfer Unit (NUT). Introduction to basic sizing of some G/L exchangers (packed column, bubble column, spray column).

Objectives

At the end of this module, the student will be familiar with the equations needed to determine the thermodynamic equilibrium properties (fugacity) of real fluids in multiphase systems. This knowledge will be applied to the determination of exchange potentials and transfer properties (viscosity, diffusivity, etc.).
Students will master the notion of transfer coefficient and be able to estimate it in a given operation.
Students will be able to apply these quantities to the generalized material balance equation applied to multiphase contactors, and will be able to dimension industrial installations such as bubble, packed and spray columns.

The student should be able to: size industrial installations such as bubble, packing and spray columns.

Necessary prerequisites

Advanced thermodynamics and application to physicochemical systems: I2BETH11
Roustan M., Transferts gaz-liquide dans les procédés de traitement des eaux et d'effluents gazeux, Editions TEC & DOC, 2003

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

Toulouse