

Program of the Course “Bubble Column Reactors – Theory and Practice”

I. Introduction

1. Principle of operation and different modes of operation;
2. Main advantages and disadvantages;
3. Major applications in different industries;

II. Description of the main hydrodynamic regimes

1. Homogeneous flow regime;
2. Transition flow regime;
3. Heterogeneous flow regime;
4. Slug flow regime;
5. Critical transition velocities;

III. Characterization of the different bubble shapes

1. Spherical bubbles;
2. Ellipsoidal bubbles;
3. Spherical-cap bubbles;
4. Taylor bubbles;

IV. Important parameters in bubble column operation

1. Sauter-mean bubble diameter;
2. Initial bubble diameter;
3. Equilibrium bubble diameter;
4. Gas holdup and its structure;
5. Bubble chord length;
6. Mixing length;
7. Liquid velocity;
8. Liquid circulation velocity;
9. Bubble rise velocity;
10. Bubble coalescence time;
11. Gas residence time;
12. Turbulent kinetic energy;

V. Liquid mixing in bubble column reactors

1. Liquid-phase axial dispersion coefficient;
2. Liquid mixing time;

3. Quality of mixedness;

VI. Gas-liquid mass transfer

1. Gas-liquid interfacial area;
2. Liquid-phase mass transfer coefficient;
3. Volumetric liquid-phase mass transfer coefficient;
4. Mass transfer time;

VII. Heat transfer

1. Heat transfer coefficient;
2. Measurement techniques;

VIII. Modern methods for flow regime identification

1. Kolmogorov entropy;
2. Reconstruction entropy;
3. Information entropy;
4. Degree of randomness;
5. New hybrid index;
6. Hurst exponent;