

INTRODUCTION TO FORMULATION

Part of Modul 2

W. Kunz (Vorlesung, Montag 9-10 h, Dienstag 10-12 h),
R. Buchner (Übungen, Montag 8-9 h)

- I. Overview, Definitions, History, (1,5 Doppelstunden)
 - Applicability
 - Classification in chemical industry
 - Typical examples and strategies of formulation

- II. Mixing and Desolving (1,5 Doppelstunden)
 - Hansen parameters
 - Hydrotropes

- III. Typical Classes of Surfactants and their Properties (3,5 Doppelstunden)
 - Overview
 - Anionic surfactants
 - Cationic surfactants
 - Nonionic surfactants
 - Zwitterionic surfactants
 - Naturally occurring surfactants
 - Polymer surfactants and special developments

- IV. Phases in binary Water-Surfactant Systems (2 Doppelstunden)
 - L1 phases: molecular and micellar solutions
 - Mesophases (lyotropic liquid crystals) and their prominent properties

- V. Phasediagrams of ternary W/T/O phases (3 Doppelstunden)
 - Introduction and examples
 - PIT, Winsor phases, χ -cut and fish-cut
 - HLB concept
 - **HLD** concept and „optimum“ mixture

- The „optimum“ emulsion

VI. Emulsions (3 Doppelstunden)

- Properties and methods of characterization
- Instabilities: coalescence, Ostwald ripening, creaming, sedimentation etc.
- Preparation methods
- Multiple Emulsions
- Application of the HLD concept for the practical preparation of emulsions

VII. Microemulsions (1 Doppelstunde)

- Preparation
- Charakterization and properties
- Examples and applications

VIII. Foams, Foaming and Defoaming (2 Doppelstunden)

- Preparation
- Charakterization and properties
- Gibbs-Marangoni effect
- Examples and applications

IX. Formulation of Solid Systems (2 Doppelstunden)

- Powders and powder mixtures, grain size, freely flowing mixtures
- Granulates, freeze-drying and other methods, binding agents etc.

Übungen / Calculus Class

I. Mixtures and Solutions

- Flory-Huggins model for polymer mixtures and solutions
- Cohesion energy, Hildebrand parameter, iterative estimation of solubilities
- Hansen parameters: background and applications

II. Surfactant Systems

- Prediction of aggregate structures, liquid-crystalline phases etc.

III. Mikroemulsions

- Interpretation of (quasi-) ternary phase diagrams, structure in mikroemulsions and emulsions, applications of the HLB concept