

Current Topics VIII

"Calorimetry -Introduction and its application for solutions and other condensed systems"

Lecturer

Prof. Watson Loh, Institute of Chemistry, UNICAMP, Brazil

(Specially appointed professor of Research Center for Structural Thermodynamics, Osaka University)

Schedule

To be taught at the University of Osaka, Japan

Jan/Feb 2019 (Jan 23th, 30th Feb 6th 1st and 2nd periods)

Purpose

In this lecture course, thermodynamic properties based on calorimetry of materials and experimental methods of calorimetry are explained. Students who are interested in physical chemistry of materials, solutions, polymers, surfactants, and biological systems can learn from basic points of thermodynamics and how they can apply that idea for materials.

Outline of the course

In the beginning, fundamental picture of chemical thermodynamics is explained. Then principles of experimental methods and several techniques and apparatuses for calorimetry is given. After understanding the scanning calorimetry and its application in chemistry and biology, the modern technique such as isothermal titration calorimetry (ITC) are explained in detail. The application for kinetics analysis performed by isothermal calorimetry is also studied.

Ability to be acquired

Throughout the lecture course, students can acquire enough knowledge of calorimetry and thermal analyses through understanding of their operating principles and analyses with several examples of condensed systems.

Detail Program

1. Fundamentals of Thermodynamics related to calorimetry studies (Revision)

(one module: 90 min)

2. Calorimetry: Historic background, Principles and Technical Aspects, Examples of Modern Equipments

(One module: 90 min)

3. Scanning Calorimetry and applications in materials and solutions (biologically relevant systems, polymer and surfactant solutions)

(One module: 90 min)

4. Isothermal Calorimetry: Titration calorimetry and Applications for studies on: surfactant/polymer aggregation, binding in systems of biological interest. Solution calorimetry

(Three modules: 3×90min)

5. Kinetic studies using isothermal calorimetry

(One module: 90 min)