Course Title: Advanced Thermal Analysis

Course Code: CH-805

Credit Hours: 3-0

Prerequisite: Nil

Course Objectives

This course will introduce the advanced concepts, instrumentation and application of thermal methods of analysis.

Course Outcomes

The students would enable students to understand the advanced thermal analytical techniques, their instrumentation, and their applications in the industry and academia.

Course Contents

Techniques in Thermogravimetry: Thermogravimetery (TG), Derivative thermogravimetric analysis (DTG), Differential Thermal analysis (DTA), Differential Scanning calorimeter (DSC), Endothermic and exothermic effects, Instrumentation and techniques: Sources of error in TG, Multiple techniques in thermal analysis, Evolved gas analysis, Thermogravimetric curves and their interpretation. Applications of thermal analysis: Determination of thermal constants, Phase changes and phase equilibria, Structural changes, Thermal stability, Thermal decomposition, Chemical reactivity, Characterization of materials, Qualitative analysis, Quantitative analysis of mixtures, Quality control- assessment of purity, Hydration, solvation and coordination effects, l) Kinetic studies and Thermodynamic studies. Practical applications of DTA/DSC: Calculation of kinetic parameters from TG curves. Various methods for calculations of kinetic parameters, Literature review and oral presentation by students. Application of Temperature Programed Oxidation (TPO) and Temperature Programed Reduction (TPR).

Recommended Books

1. P.J. Haines, Thermal Methods of Analysis, Blackie Academic and Professional, London (1995).
2. W.W.M. Wendlandt, Thermal Analysis, 3rd ed., John Wiley, New York (1986).
3. Principles and Applications of Thermal Analysis, Paul Gabbott (Editor), ISBN: 978-0-470-69812-Wiley-Blackwell (2008).
4. Thermal Analysis in Practice, Author: Wagner, M. ISBN: 978-1-56990-643-9, Hanser Publications 2018.