CD 225 January 0:4

Physical and Analytical Chemistry Laboratory

Instructor

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Department: Integrated Ph.D. Chemical Sciences

Course Time: 2:00-05:00 PM

Lecture venue: Integrated Ph.D. Laboratory, UG Sciences Building

Detailed Course Page:

Announcements

The course starts from Jan 2, 2018

Brief description of the course

This is a core a practical course for Integrated Ph.D. Students of the Chemical Sciences Division. The course comprises of experiments related to titrations using potentiometry, conductimetry, and pH-metry techniques, iodometry spectroscopy, X-ray crystallography, electrochemistry.

Prerequisites

The students should have adequate knowledge of Physical Chemistry

Syllabus

List of experiments

No. Category Details

1. Conductometry a) Determine the composition of a mixture of

mixed acids versus strong base and mixed bases

versus strong acids by conductometric titration

b) Determine critical micellar concentration of

cationic and anionic surfactants by

conductometric method

2. Iodometry a) Estimate Cu 2+ and Fe 3+ contents in CuSO 4 .5H 2 O

and FeCl 3 by iodometric method

b) Determine the stoichiometry of any two

compounds- Cupric oxide (CuO), Manganese

dioxide (MnO 2), Iron oxide (Fe 3 O 4)

3. pH-metry and

Infrared

Spectroscopy

a) Determination of pk a and pk b of at least two

acids and two bases (list provided)

b) Record the IR spectra of at least three different

organic compounds (options provided) and

assign vibrational bands and the fingerprint

region

4. Potentiometry a) Estimate Mn2+ ion in a Mn-salt using sodium

pyrophosphate

b) Estimation of Mohr salt by permanganate and

dichromate solutions (compare the results with

direct volumetric methods)

c) Determine and compare solubility product of

AgCl, AgBr, AgI and Ag 2 CrO 4

5. Verification of

Langmuir Adsorption

Isotherm

Any two-

Iodine, Acetic acid, Formic acid adsorption on

charcoal

6. UV-VIS Spectroscopy a) Determine the photocatalytic activity of TiO 2

(under dark and light) with respect to a cationic

and anionic dye available

b) Determine charge-transfer (C-T) band and

equilibrium constant of I 2 with any n-donor

7. Cyclic Voltammetry Glucose Biosensors

8. X-ray Diffraction a) Prepare CeO2 and ZrO2 by the solution

combustion method

b) Record and index the powder XRD patterns

c) Determine the lattice parameters and calculate

the crystallite size by Scherer formula

9. Fluorescence a) Record the fluorescence spectra of atleast

three dyes in solvents varying polarity

b) Show emission spectra and quantum yield

c) With at least one of the dyes, show how

binding can be monitored with changes in

intensity

10. Flame Photometry

(Demonstration

Experiment)

Estimation of Na + /K + /Li + /Ca 2+ ion concentrations in

three unknown water samples collected from

various locations within the Institute

11. Thermogravimetric

Analysis

(Demonstration

Experiment)

Record the weight loss of calcium oxalate, nickel

hydroxide and copper sulfate between room

temperature and 700Â°C

Course outcomes

The students learn various physical chemistry principles, various types of chemical titrations, measurements techniques related various spectroscopic techniques, X-ray diffraction, thermal methods, electrocemical methods

Grading policy

The grading policy is as follows:

1. Weekly assesment and viva-voce

2. Mid Term

3. End-Term

4. Experiment Records

Assignments

Resources