CH-322 Advanced Inorganic Chemistry

Credit Hours: 2-1

Pre-requisite: Nil

Course Objectives

1. Students will acquire knowledge about the basic coordination chemistry, theory and applications of coordination compounds, solvents classification and detailed study of reaction types in various solvents.

Detailed Contents

2. Basic coordination chemistry: nomenclature, geometry of complexes, theories of coordination compounds (Werner's Theory, valence bond theory, crystal field theory, molecular orbital theory, and ligand field theory), isomerism and stereochemistry, complex stability and factors affecting stability, applications of coordination compounds. Structure and energetics of inorganic molecules.
3. Chemistry of f-block elements (lanthanides, actinides): spectral and magnetic properties, oxidation states, electronic structure, lanthanide contraction. Magnetochemistry: theory of magnetism, diamagnetism, paramagnetism, ferro-, ferri- and antiferromagnetism, magnetic susceptibility.

Course Outcomes

4. At the end of the course, students will be able to understand introductory coordination chemistry, theories of coordination compounds, and an introduction to non-aqueous solvents.

Relevant Experiments

1. Separation and estimation of pairs of metal ions by paper chromatography, such as:
2. Cu^{2+}/Ni^{2+}
3. Al^{3+}/Fe^{3+}
4. Ca^{2+}/Ba^{2+}
5. Zn^{2+}/Pb^{2+}
6. Spectrophotometric determination of divalent metal ions in complexes using titration method. Spectrophotometric determination of trivalent

metal ions in complexes using titration method. Separation of Fe2+/Fe3+ and Zn2+ in a given sample by precipitation method.

7. Estimation of Ag^{+1} and Cu^{2+} in a given mixture using the titration/precipitation method.
8. Estimation of Cu^{2+} and Ni^{2+} in the given mixture using the titration/precipitation method.
9. Estimation of Cu^{2+} and Pb^{2+} in given sample gravimetrically.
10. Estimation of Ba^{2+} and Ca^{2+} in given sample gravimetrically.

Recommended Books

1. F.A. Cotton, et al., Advanced Inorganic Chemistry, 6th ed., John Wiley, New York (1999).
2. J.E. Huheey, E.A. Keitlu and R.L. Keitlu, Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed., Addison-Wesley, Reading (1997).
3. G. Miessler and D.A. Torr, Inorganic Chemistry, 5th ed., Pearson-Printice Hall, USA (2013).
4. A.J. Emeleus and A.G. Sharp, Modern Aspects of Inorganic Chemistry, Read K. Paul, London, 3rd ed., Addison-WessleyLongmann, Inc., UK (1999).
5. T. Moeller, The Chemistry of the Lanthanides, Chapman and Hall Ltd. London (1965).
6. J.D. Lee, Concise Inorganic Chemistry, Chapman and Hall London, 5th ed., Wiley-Blackwell, UK (2008).
7. A.I. Vogel, A Textbook of Quantitative Inorganic Analysis: Theory and Practice, Green and Co. Ltd., London (2000).
8. J. Mendham, R.C. Denney, J.D. Barnes, and M. Thomas, Vogel's Textbook of Quantitative chemical Analysis, 6th ed., Pearson Education Ltd. (2000)