MANGALORE UNIVERSITY

Department of Industrial Chemistry

ICH 502: INDUSTRIAL CATALYSIS AND POLYMERS

Course Outcomes:

1. Students learn about preparation of catalyst and their behaviour with reference to their performance criteria.
2. Organometallic compounds used as catalysts in industry for various processes for manufacture of small molecules and polymers.
3. Studies on polymer basic concept and processing technique and uses of polymer in biological field are learnt.

UNIT I: **14 hrs**

Preparation of catalyst and their behaviour, Selection, preparation and evaluation of catalysts-test reaction, promoters, carriers and stabilisers, Role of s upports, preparation & structure of supports, silica, alumina, silica-alumina, zeolites, carbon catalyst manufacture, catalyst size and shape, pre-treatments, deactivation process, sintering, poisoning and catalyst fouling,Nano cataysts. **Definition of performance criteria of catalysts:** Activity, selectivity, temperature response, catalyst life. Surface active agents, classification of surface active agents, micellisation, hydrophobic interactions, critical micellar concentration (CMC), factors affecting the CMC of surfactants.

UNIT II: **14 hrs**

Catalysis by Organometallic Compounds:

Transition metal hydrides: Synthetic routes, structure and reactivity, synthetic applications. (Cu, Pd, Ni, Fe, Co, Ti complex); **Catalysis by organometallic compounds:** 16- and 18-electron rules, Coordinative unsaturation, oxidative addition and reductive elimination and insertion reactions, olefin hydrogenation, Wacker process, Zeigler-Natta process, olefin metathesis, Monsanto process for the synthesis of acetic acid, heterogenisation of homogeneous catalysts using polymer supports.

UNIT III:

Polymers **14 hrs**

Basic concepts and techniques in polymer chemistry. General structures & classifications of polymers. Techniques of polymerization and molecular weight determination. Structural factors, properties and uses of commercial and engineering polymers. Thermoplastics, thermosets and elestomers. Polymer processing techniques, additives for improvement of polymer properties, spinning of industrial polymers, wet and dry. Melt spinning.

UNIT IV: **14 hrs**

Polymer blend and composites-preparation, properties and uses. Introduction to nano composites. Polymers as separation devices-principles and applications of reverse osmosis, ultra and nano filtration and electrodialysis, Uses in food industry and biotechnology. Medical applications of polymers: Concepts and design of oral, transdermal and targeted drug delivery systems-micro, macro and nano sized systems. Biodegradable polymers- Sources of plastic waste, waste management techniques, environmental issues of waste management.

Composites: Introduction, classification, preparation procedures, special properties and their applications.

References

1. Material science and Engineering, W D Callister, Wiley.
2. Solid State Chemistry, A R west.
3. Modern Prospective in Solid State Chemistry,C N R Rao and J Gopalakrishnan.
4. Principles of Polymer Science, Bahadur P and N.V Shastry, Narosa, New Delhi, 2000.
5. Polymer Science and Engineering, D.J.Williams, Prentice Hall Inc, New Jersy, 1971.
6. Theory and Basics of Polymer Science, F.W. Billmeyer, John Wiley & Sons, NY,1984.
7. Industrail electrochemistry by Peltcher
8. Modern Electrochemistry, Vol I, IIA & IIB(1998) J.O.M. Bockries and A.K.N.Reddy
9. Engineering Chemistry by Jain and Jain.