

MCYF 405- Synthesis and Characterization of Materials

Module-I Introduction

10 hours

Historical Perspective, Material classification: Electronic materials, optical materials, ceramic materials, electro chemical materials.

Module-II Material synthesis

16 hours

Synthesis of bulk Polycrystalline Materials: Direct combination, chemical precursor methods, reactive thermal evaporation, sono-chemical methods of nano-material synthesis, co-precipitation method, Sol-gel technique, nano-phase materials, composites, high pressure and high temperature techniques. Bulk Single Crystal Materials: Principles and methods: melt and flux techniques, chemical vapors transport techniques: hydrothermal synthesis: growth by fused salt electrolysis: Zone refining.

Module-III Characterization Techniques and Applications

14 hours

Destructive Techniques: Principles of chemical analysis, DTA, TGA, DSC. Non-destructive Techniques: use of x-ray electron and neutron diffraction techniques. Applications of material in heterogeneous catalysis, textiles and fabric, health care.

Essential Readings

1. Materials Synthesis and Characterization, Dale L. Perry, Springer; reprint of the original 1st ed. 1997 edition, 2013.
2. Materials Science and Engineering: An Introduction, William D. Callister, Jr., John Wiley & Sons, Inc., 7th edition, 2007
3. Synthesis and Characterization of Advanced Materials, National Academy Press, Washington D. C., 1984 <http://www.nap.edu/catalog/10846.html>