National Institute of Technology
Tiruchirappalli-620 015
Department of Chemistry

Synthesis and Characterization of Nanoinorganic Materials

Unit: I

Hydrothermal Technology: - Principle and applications-hydrothermal for mesorporos and micro porous materials-hydrothermal for crystal growth-nucleation theory-aggregation process –solid state transorformation-aging effects in crystal growth-Surfactant-classifications (anionic, cationic and neutral) template –mesoroporous/micro porous materials interaction-calcination –synthesis of various metal oxide materials using hydrothermal method.

Unit: II

Sonochemical technology: - Introduction, instrumentation-types of sonochemical reaction in homogenous and heterogeneous system-Acoustic Cavitations-Sonoluminescence-Sonocatalyst-Synthesis of mesoporou/micro porous materials using ultrasonicator method.

Unit: III

Microwave Technology: - Introduction, instrumentation-basic physical principles of microwaves and microwave heating-specific microwave effect-comparison between microwave heating and the conventional heating synthesis-formation mechanism of mesoporous /microsporous materials under microwaveirradiation. Thermal and non-thermal effects. Synthesis of various mesoporous/microporus materials (metal oxide, doped metal oxide, metal oxide doped polymers)

Unit: 1V

Nanotechnology:-Introduction-nano dots - nanomaterials - preparation - plasma arching - sol gels - electro deposition - ball milling -applications of nano materials - carbon nano tubes - molecular switches - rotaxanes and catenanes - lithography - nano bio metrics - future applications- synthesis of metal oxide nanomaterial-mixed metal oxide nanomaterial-magnetic Core-Shell properties.

Unit: V

Characterization techniques for nanomaterials-TEM, AFM, MFM, NANOINDENTATION-Conventional method for synthesis of mesoporous/microporous materials-using polymers, macrocylic ligands-co-precipitation method-Solvothermal method-

References:-

1. Nanotechnology - Basic Science and Emerging Technologies, MichWilson, Kamali Kannangari, Geoff Smith, 2005, overseas press India private ltd.

2. V. K. Ahluwalia and M. Kidwai, New Trends in Green Chemistry, II edition, Anamaya publishers, New Delhi, 2006

3. Microwave synthesis of zeolite membranes: A review-Yanshuo Li, Weishen Yang.

4. Hydrothermal synthesis of crystals- A. N. Lobachev