

## CH H 503: SOLID STATE CHEMISTRY

### COURSE OUTCOME:

- It is an interdisciplinary course falling at the boundary of physics and chemistry.
- It is aimed at understanding the properties of solids and their possible applications in materials science as superconductors, semiconductors, liquid crystal materials and as magnetic materials.
- Importance has been given to the methods of preparation of solids, understanding the structure-property relationships and their possible applications.
- Importance has also been given to the advanced topics of nanomaterials.

### UNIT-I: [15 hours]

**Surface morphology:** Structure of solid surfaces and adsorbed layers. Mechanism of surface reactions. 3hrs.

**Crystal Defects and Non-Stoichiometry:** Imperfections and defects in crystals. Vacancy, Schottky and Frenkel defects. Thermodynamics of Schottky and Frenkel defect formation, colour centres, non-stoichiometry and defects—Structures of  $\text{UO}_2$ ,  $\text{FeO}$  and  $\text{TiO}_2$ . 4hrs. **Solid State Reactions:** General Principles, Wagner's theory. Order-disorder transitions in solids- Bragg-William's theory Mechanism of diffusion, Kirkendall effect. 3 hrs **Preparative Methods:** Ceramic, sol-gel, precursor and chemical vapour deposition (CVD) methods. Nucleation & crystal growth techniques-pulling, zoning, flame fusion & skull melting. Basic methods of preparation of thin films. 5 hrs

### UNIT-II: [15 hours]

**Electronic Properties and Band Theory:** Free electron theory to band theory of solids, electrical conductivity, Hall effect. Metals, Insulators and Semiconductors. Intrinsic and extrinsic semiconductors, hopping semiconductors. Metal – semiconductor and p-n junctions. 6 hrs

**Magnetic properties:** Classification of magnetic materials—dia, para, ferro, ferri, antiferro & antiferri magnetic types Langevin diamagnetism. Selected magnetic materials such as spinels & garnets. 4hrs **Ionic Conductors:** Types of ionic conductors, mechanism of ionic conduction, diffusion superionic conductors; phase transitions and mechanism of conduction in superionic conductors, examples— $\alpha$ -alumina, AgI, halide and oxide ion conductors 5 hrs

### UNIT - III : [15 Hours]

**Superconductivity:** Meissner effects; Types I and II superconductors, Features of superconductors, isotope effect, high  $T_c$  materials. Basics of low temperature superconductivity. 5hrs. **Liquid Crystals:** Mesomorphic behaviour, thermotropic liquid crystals, positional order, bond orientational order, nematic and smectic mesophases; smectic – nematic transition and clearing temperature- homeotropic, planar and schlieren textures, twisted nematics chiral nematics, molecular arrangements in smectic A & C phases. Optical properties of liquid crystals 5hrs. **Nanomaterials:** Introduction—importance and characterization of nanomaterials—stability of nanoparticles In solutions – synthesis of metal nanomaterials: Physical methods (Laser Ablation, Evaporation, sputtering and solvated metal dispersion) chemical methods (Thermolysis, Sonochemical approach, reduction of metal ions by hydrogen and methanol) 5hrs.

## REFERENCES:

1. D. K. Chakrabarty, Solid state chemistry (New Age) 1996.
2. H.V.Keer, Principles of the solid state ( Wiley Eastern ) 1993.
3. A.R.West, Solid state chemistry and its applications (Wiley) 1984.
4. L.Smart and E. Moore, Solid State Chemistry –An Introduction (Chapman &Hall)1992.
5. L. Azaroff, An Introduction to Solids (Mc Graw Hill).
6. V. Raghavan, Material science and Engineering (3<sup>rd</sup> Ed), (Prentice Hall India)1993.
7. Thermotropic Liquid Crystals, Ed. G.W. Gray, Wiley.
8. S. Chandrasekhar, Liquid Crystals, Cambridge University Press (2<sup>nd</sup>ed), 1994.
9. Chemical Kinetics, K. J. Laidler, Pearson Education, Anand Sons(India) 3<sup>rd</sup> edition (2008)
10. Physical Chemistry at surfaces, 6<sup>th</sup> ed., A.W Adamson and A P Gast, John Wiley, Canada, 1997.
11. C.P.Poole and F.K.Owens Introduction to Nanotechnology, (2004).
12. T.Pradeep, Nano: The Essential, Tata McGraw Hill Publishing Company Ltd., New Delhi, (2008).

## CH S 504: Medicinal and Natural Products Chemistry

### COURSE OUTCOME:

- Students will gain an understanding on the classification and nomenclature of drugs, modern theories of drug action and drug design.
- Students will be able to know classification, synthesis and mode of action of antipyretic analgesic drugs, general anesthetics, local anesthetics, cardiovascular drugs, antineoplastic agents and antiviral drugs with suitable examples.
- Students will get a good understanding of isolation, classification,
- methods of structure elucidation and synthesis of various types of alkaloids, terpenoids and steroids with suitable examples.

### UNIT- I:

[12 Hours]

**Drugs:** Introduction, Classification and nomenclature of drugs. Theories of drug action-Occupancy theory, Induced fit theory and Perturbation theory. Analogues and Prodrugs, Factors governing drug design. Rational approach to drug design, Variation method of drug designing, Physico-Chemical factors, stereochemistry and biological activities. Factors governing the ability of drugs.

**Antipyretic Analgesics:** Classification, synthesis & mode of action of Phenacetin, Aspirin, Cinchophen, Phenazone and Mefenamic acid.

**General Anesthetics:** Introduction and classification, synthesis & mode of action of methoxy fluorane, Thiopental sodium and Fentanyl citrate.

**Local anesthetics:** Introduction and classification, synthesis & mode of action of benzocaine,  $\alpha$ -Eucaine, Lignocaine hydrochloride and Dibucaine hydrochloride.

### UNIT- II:

[12 hours]

**Cardiovascular drugs:** Introduction & classification, Synthesis & mode of action of Hydralazine, Methyldopa, Diazoxide, Procainamide, Propranolol, Prenylamine.

**Antimalarials:** Introduction and classification, Synthesis & mode of action of Chloroquinephosphate, Pamaquine and pyrimethanin.

**Antineoplastic agents:** Introduction and classification, Synthesis & mode of action of Mechlorethamine hydrochloride, Busulfan triethylenemelamine, Methotrexate and

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Jointly Organise an International Webinar

on

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December 17 - 19, 2020



• Free Registration. • e - certificates to participants

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### Resource Persons



**Dr. Ram Bhat**  
Sr. Director

Millennium Research Laboratories, Inc, USA



**Dr. Bhaskar Naik**  
Founder & MD., Petropath Ltd.,  
Owner of Naik Laboratories, Bengaluru



**Dr. Vijayaraj K. K.**  
Senior Manager

R&D, Jubilant OraxImago, Canada



**Sri. Gokuldas Nayak**  
Joint Director,  
Dept. of Industries & Commerce  
Govt. of Karnataka



**Dr. V. Pardhasaradhi**

VP and Agrosiences Business Unit Head  
Eurofins Advinus Ltd., Bengaluru



**Dr. Shridhara K.**  
Technical Coordinator  
ArkGen Pharma Pvt. Ltd., Bengaluru



**Dr. Shashidhar**

Director  
Kohlen Laboratories LLP, Mysore

### Patron

**Prof. P. S. Yadapadithaya, Hon'ble Vice Chancellor**

**Prof. Boja Poojary**  
Convenor

**Prof. G. K. Nagaraja**  
Chairman

**Sri K. Raju Mogaveera, KAS**  
Registrar

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**Prof. Balakrishna Kalluraya**

**Prof. B. Narayana**

**Prof. B. Vishalakshi**

**Prof. Jagadeesh Prasad D.**

**Dr. M. R. Maddani**





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**Program Schedule**

**Thursday, 17-12-2020**

- 10.00am-10.30am Inauguration
- 10.30am-11.30am **Lecture 1: Dr. Ram Bhat, Sr. Director, Millennium Research Laboratories, Inc, USA**  
**Title** The Next Challenges and Opportunities
- 11.45am-12.45pm **Lecture 2: Dr. Bhaskar Naik, Founder & MD., Petropath Drilling Fluids India Pvt Ltd, Owner of Naik Laboratories, Bengaluru**  
**Title** Small & Medium Size Enterprise Opportunities for Chemistry Graduates

**Friday, 18-12-2020**

- 09.00am-10.00am **Lecture 3: Dr. Vijayaraj K. K., Senior Manager R&D, Jubilant Draximage, Canada**  
**Title** Molecular Imaging & Wonderful Opportunities for Chemistry Professionals
- 10.15am-11.15am **Lecture 4: Dr. V. Pardhasaradhi, Vice President – Agroscience Services Eurofins Advinus Limited, Bengaluru**  
**Title** Environmental Risk Assessment of Chemicals
- 11.30am-12.30pm **Lecture 5: Dr. Shridhara K, Technical Coordinator ArkGen Pharma Pvt., Ltd., Bengaluru**  
**Title** How to become a successful Entrepreneur

**Saturday, 19-12-2020**

- 10.30am-11.30am **Lecture 6: Sri. Gokuldas Nayak, Joint Director Dept. of Industries & Commerce, Govt. of Karnataka**  
**Title** State Government Support to MSMEs
- 11.45am-12.45pm **Lecture 7: Dr. Shashidhar, Director, Kohlen Laboratories LLP, Mysore**  
**Title** Employee to entrepreneur-taking the leap
- 12.45pm-01.15pm Valedictory



# Mangalore University



## Department of Studies in Chemistry and

## Department of Industries & Commerce

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| <br>Dr. V. Pardhasaradhi<br>VP and Agrotech Business Unit Head<br>Cavintus Adivinus Ltd., Bengaluru | <br>Sri. Gokuldas Nayak<br>Joint Director<br>Dept. of Industries & Commerce<br>Govt. of Karnataka | <br>Dr. Shridhara K.<br>Technical Coordinator<br>ArkGen Pharma Pvt. Ltd., Bengaluru |
| <br>Dr. Shashidhar<br>Senior<br>Kohlen Laboratories LLP, Mysuru                                     | Patron<br>Prof. P. S. Yadapadithaya, Hon'ble Vice Chancellor                                      |   |
| Prof. Boja Poojary<br>Convener  | Prof. G. K. Nagaraja<br>Chairman  | Sri K. Raju Mogaveera, IAS<br>Registrar   |
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Department of Studies in Chemistry, Mangalore University and Department of Industries & Commerce, Government of Karnataka, Mangalore District Industries Centre jointly organised an international webinar on Prospectives of Entrepreneurship for Chemists (PEC 2020) during December 17 - 19, 2020.

As the title of webinar indicates, this webinar was mainly focussed on enlightening the prospectives of entrepreneurship to chemists. In this context, Eminent Scientists from various industries and organizations across India and abroad were invited as resource speakers to deliver the lectures.

Day 1 activities were initiated by inaugurational function. Sri. Gokuldas Nayak, Joint Director, Dept. of Industries & Commerce, Govt. of Karnataka was our guest of honor. Prof. P. S. Yadapadithaya presided over the Inauguration function on 17<sup>th</sup> December 2021. After the Inauguration, Dr. Ram Bhat, Sr. Director, Millennium Research Laboratories, Inc, USA, delivered the lecture on 'The Next Challenges and Opportunities'. The 2<sup>nd</sup> lecture was delivered by Dr. Bhaskar Naik, Founder & MD., Petropath Drilling Fluids India Pvt



Ltd, Owner of Naik Laboratories, Bengaluru on the topic 'Small & Medium Size Enterprise Opportunities for Chemistry Graduates'.

On Day 2, Dr. Vijayaraj K. K., Senior Manager R&D, Jubilant DraxImage, Canada delivered the lecture on 'Molecular Imaging & Wonderful Opportunities for Chemistry Professionals'. Subsequently, Dr. V. Pardhasaradhi, Vice President – Agrosience Services, Eurofins Advinus Limited, Bengaluru presented on the topic 'Environmental Risk Assessment of Chemicals'. The 3rd lecture on Day 2 was presented by Dr. Shridhara K., Technical Coordinator, ArkGen Pharma Pvt., Ltd., Bengaluru on 'How to become a successful Entrepreneur?'

On Day 3, the first lecture was given by Sri. Gokuldas Nayak, Joint Director, Dept. of Industries & Commerce, Govt. of Karnataka on the topic 'State Government Support to MSMEs'. Later on, Dr. Shashidhar, Director, Kohlen Laboratories LLP, Mysore delivered the lecture on 'Employee to entrepreneur-taking the leap'.

Faculties of various institutions, Graduate and Post graduate chemistry students, Guest faculties and other invitees participated in the webinar. Overall around 300 participants benefited from this webinar. Feedback from participants showed that, they enjoyed the webinar and appreciated all the resource persons and lectures delivered. All the resource persons were very happy to interact with participants. Finally the webinar ended up with valedictory program.

