



LECTURE SERIES REPORT ON
CATALYSIS FOR SUSTAINABLE ECO ENGINEERING DESIGN (CAT-
SEED 2019)
23RD AND 24TH JULY 2019

Introduction

The Department of Chemical Engineering, School of Bio and Chemical Engineering had organized a lecture series on CATALYSIS FOR SUSTAINABLE ECO ENGINEERING DESIGN (CAT- SEED 2019). This series focused on the applications of catalysts in process industry and how this is beneficial to the environment. The goal is to stimulate intellectual discussion on topics of relevance to nanocatalyst synthesis and characterization. This report documents activities in the power lecture series on Sathyabama Institute of Science and Technology campus on 23rd and 24th July 2019. It briefly outlines the presentations made by the distinguished invited guests whose focus was on catalysis for sustainable eco friendly environment. It also includes the remarks made by the discussant of the lecture as well as comments and suggestions made during plenary by the audience. The deliberations of this power lecture series will pay way for a new future in economically, eco-friendly nano catalysis /catalytic greener process. The lecture specifically focused on the choice of catalysts which is highly profitable owing to selectivity, yield, economic and environmental friendly process.

Objectives of the Lecture Series

The overall aim of the CAT- SEED 2019, foster synergies and strengthen the young chemical engineers in the field of catalyst and chemical reaction engineering. More specifically, the forum will give the audience the opportunity to:

1. Synthesis and choice of new catalyst
2. Explore the recent Advancements in Catalytic Science and Technology.
3. Discussion on the characterization of the nanocatalyst
4. Discuss current state in Carbon Abatement Technologies

Expected Outcome

The lecture series was intended to have three major outcomes:

- To provide critical input to the research and discussion on catalysis
- To strengthen networks of collaborations with different organizations, institutions in the field of Catalyst and
- To serve as a platform for sharing lessons learnt in the discussion on CAT SEED 2019.

Participants

The lecture series brought together distinguished representatives from State agencies as the keynote speakers, students, faculties from different institutions of Higher learning, and Non-Governmental Organizations.

Areas of Presentation

- Recent Advancements in Catalytic Science and Technology
- Role of catalysis in Carbon Abatement Technologies
- Nano-catalyst – Fueling the chemical industry's future.
- Catalytic converters Developing sustainable strategies
- Catalyst for Clean Development Mechanism
- Catalyst characterization

Dr. Wilson Aruni, Pro Vice Chancellor, Convener opened the Power Lecture Series CAT SEED 2019 by welcoming guests and briefly highlighting the significance of the lecture series which was implementing the mission to conduct applied research, training in the field of catalysis. The convener informed the audience that the key objective of the lecture series would enable the centre an opportunity to illuminate on the synthesis of nanocatalyst for sustainable environment. **Dr. Wilson Aruni** concluded by introducing the speaker of the lecture series **Professor Jithin John Varghese**, Department of Chemical Engineering Indian Institute of Technology, Madras and **Dr. Venkatarathnam** who is also a retired Senior Research scientist at the CSIR-CLRI.



Presidential address by Dr. Wilson Aruni Pro Vice Chancellor & Convener



Inaugural address by Dr. Jithin John Varghese (Keynote Speaker)

Dr. Jithin went further on to state that these concerns formed on the 'Trends in catalytic processes'. He urged the audience to engage with the topics presented in order to enrich the important discussion on catalytic process. As the speaker, Professor Jithin thanked the convener and the board of management who made the lecture series.



(Chief Guest Dr.G.Venkatarathnam, Dr.Wilson Aruni Pro Vice Chancellor & Convener, Dr.Jithin John Varghese Speaker, Dr.S.Sathish and Dr.D.Prabu Organizing Secretaries during inauguration event)

The Lecture series was initiated by **Dr. Jithin John Varghese**, Associate Professor, IIT Madras, **Dr.N.Balasubramanian**, Professor Anna University followed with the afternoon session by **Dr.R.Vinu**, Associate Professor, IIT Madras and **Dr.M.Sathish**, Scientist CECRI, Karaikudi. The Day 2 Lecture series was initiated by **Dr. Venkatarathnam**, Principal Scientist CLRI, **Dr.T.Kirthiga** and **Dr.Chennakesavulu** from Sathyabama Institute of Science and Technology and **Dr.A.Sivasamy**, Senior Principal Scientist, CSIR-CLRI. The second day of lecture series highlights the importance of catalysts in process industry to synthesis value added products which specifically focusing on chemical, pharmaceutical industries and their environmental application which specifically focusing on sustainable eco friendly environment.

Session 1 (Day 1) – 10:15AM – 11:30AM

Dr.Jithin John Varghese from IIT Madras delivered the first lecture on “**CATALYSIS FOR SUSTAINABLE REACTION ENGINEERING**”. The presentation highlights the Industry Version 4.0 for the development of catalyst for the sustainable production. Moreover the topics covered the “Waste to Wealth” by integrated hydropyrolysis and hydroconversion. The lecture briefly explained the mechanism of catalytic screening, structure

property relations, and computational catalysis.



Dr.Jithin John Varghese, IIT Madras addressing the participants

Session 2 (Day 1) – 11:30AM – 12:30PM

Dr.N.Balasubramanian from AC Tech – Anna University deliver the lecture on **“GRAPHENE OXIDE–BIOBR COMPOSITE MATERIAL AS HIGHLY EFFICIENT PHOTOCATALYST FOR DEGRADATION OF METHYLENE BLUE AND RHODAMINE-B DYES”**. The topic highlights the mechanism of photocatalytic effect of GO/BiOBr composite. He presented the synthesis of graphene oxide (GO)/BiOBr composite, using a simple two-step process. The tetragonal phase of BiOBr was incorporated into GO sheets, and was employed as a photocatalyst for the environmental application for the treatment of textile waste water.

Session 3 (Day 1) – 1:00PM – 2:00PM

Dr.R.Vinu from IIT Madras delivered the lecture on **“CATALYTIC FAST PYROLYSIS OF BIOMASS AND POLYMERS FOR FINE CHEMICALS AND RESOURCE RECOVERY”**. The presentation covers the topic of importance of biomass and waste plastics conversion, Catalytic fast pyrolysis of polymers – polystyrene, Catalytic fast pyrolysis of lignin and Catalytic fast hydrolysis of biomass. The lecture highlights the mechanism of catalytic reactions, analytic measurement of particle size and rate controlling regime.



Dr.Vinu, IIT Madras addressing the participants

Session 4 (Day 1) – 2:00PM – 3:00PM

The last session of the day 1 was delivered by **Dr.M.Sathish** from CSIR-CECRI Karaikudi on **“SYNTHESIS OF NANOCATALYST”**. He highlights the revitalization of the research on catalytic materials and industrial catalysts were observed with the development of nanotechnology. He pointed the use of nanomaterials in catalysis and, more particularly, inorganic nanoparticles to develop innovative and greener protocols. These nanoparticles can be utilized as the catalyst or as support and can facilitate the catalytic process



Dr.M.Sathish, Principal Scientist, CSIR-CECRI

DAY 2 (July 24th 2019) INTRODUCTION

The second day of the power lecture series was started by **Dr.S.Sundar Manoharan**, Vice Chancellor of Sathyabama Institute of Science and Technology. Dr.Sundarmanoharan briefly explained the applications of the lecture topic and the current scenario in the development of catalyst. He highlighted the opportunities for the research funding in the field of catalytic development.



Dr.Sundar Manoharn, Vice chancellor addressing the gathering

Session 1 (Day 2) – 8:30AM – 10:00AM



Dr.G.Venkatarathnam – Senior Principal Scientist CSIR-CLRI (Rtd)

Dr.G.Venkatarathnam, retired Senior Principal Scientist for CSIR-CLRI delivered the first lecture on day 2 on the topic **“DEVELOPMENT AND SCALE UP OF CHEMICAL PROCESSES.”** The lecture briefly describe about the process synthesis and selection of separation process. The lecture highlights how the process can be develop into a commercial scale from the laboratory scale.

Session 2 (Day 2) – 10:15AM – 11:15AM

Dr.T.Kirthiga, Associate Professor, Department of Chemistry, Sathyabama Institute of Science and Technology delivered the lecture on **“AN INTERACTIVE TALK ON XRD FOR RESEARCH ASPIRANT”**. The lecture covers the characterization of catalyst by using XRD. She made the session interactive by asking the students to identify the patterns from the sample XRD spectra.

Session 3 (Day 2) – 11:15AM – 12:30PM

Dr. Arumugam Sivasamy, Senior Principal Scientist from CSIR-CLRI delivered the lecture on “**NANOPHOTOCATALYSIS FOR SUSTAINABLE INDUSTRIAL DEVELOPMENT PROCESSES**”. The lecture highlights the application of Semiconductor photocatalysis is gaining importance in various fields’ in particular environmental remediation and energy conversion etc. To overcome these demerits newer nano photocatalysts, he explained the design and development of new hybrid nano photocatalytic materials which is based on ZnO nanocrystalline in the form of pristine, doped with cation and anion, composites and core-shell etc.



Dr.A.Sivasamy– Senior Principal Scientist CSIR-CLRI

Session 4 (Day 2) – 1:00PM – 2:30PM

Dr.K.Chennakesavulu, Associate Professor, Department of Chemistry, Sathyabama Institute of Science and Technology delivered the lecture on “**IMPORTANT OF INSTRUMENTAL METHODS AND THE INTERPRETATION OF THEIR RESULTS**”. The lecture overlay the concepts of surface science for the measurement of pore size of the catalyst using BET analysis and surface area estimation. The lecture highlights the key feature about the characterization by using SEM, FTIR, contact angle and surface energy calculations.

Valedictory function (2:30PM – 3:00PM)

After the presentations and remarks by the discussant, the audiences were given an opportunity to contribute to the broader discussion with the speakers. The organizing secretary **Dr.S.Sathish**, deliver the valedictory note that the forum should give the opportunity to interrogate the field of catalysis and we have achieved the objectives. **Dr.D.Prabu** organizing secretary deliver the vote of thanks. He conveys his gratefulness to the management of Sathyabama, CSIR institute for sponsoring this great event and the participants from various institutions and in-house participants. With those few remarks he convey his thankfulness to the distinguished speakers without them the event will not attain the grand success. The series concluded with the Certificate Distribution Ceremony presided over by the Chief Guest **Dr.G.Venkatarathnam**.



Dr.S.Sathish, summing up the two day lecture series



Dr.D.Prabu, highlighting the future perceptive of catalyst



Glimpse of Certificate distribution to the participants



Convener, Coordinators and Staff of Department of Chemical Engineering