

Mechanistic Modeling of Thermochemical Conversion of Hydrocarbons and Solid Fuels

Overview

Understanding the mechanism and kinetics of thermochemical processes like pyrolysis, combustion and gasification is vital for better design of reactors and also to improve the efficiency of the processes for energy and fuels production. Thermochemical processing of hydrocarbon fuels and solid fuels like lignocellulosic biomass, plastics and municipal solid wastes involve a number of competing reactions that are vital to the formation of specific products under different operating conditions like temperature, pressure, residence time, air:fuel ratio, particle size and presence of heterogeneous catalysts. The topics that will be covered in this course include: fundamentals of chemical kinetics, thermochemistry and thermodynamics; elementary reactions in pyrolysis and combustion of hydrocarbon mixtures, coal, biomass and plastics, steam cracking of hydrocarbons; NO_x and soot formation mechanisms in combustion; combustion of practical fuels and surrogate mixtures; lumping procedures in detailed kinetic models using reference species; case studies of biomass combustion in a travelling grate; kinetic modelling of polymer pyrolysis using distribution kinetics; catalytic conversion of biomass and polymers to fine chemicals and fuel molecules.

Dates of the course	28 May to 1 June, 2018
Host institute	IIT Madras
No. of credits	1
Max. participants	30
You should attend if you are	<ul style="list-style-type: none"> ▪ Student at all levels (Senior B.E./B.Tech. / M.Tech. / M.S. / M.Sc. / Ph.D.) interested in the area of thermochemical processes for energy and fuels ▪ Faculty from reputed academic and technical institutions or universities ▪ Engineer and/or professional from national/multinational industry ▪ Engineer and/or researcher from government R&D laboratory
Course registration fees	<p>The participation fees for taking the course is as follows:</p> <p style="text-align: center;">Student participants: Rs. 1,000 Faculty participants: Rs. 4,000 Government research organization: Rs. 4,000 Industry participants: Rs. 8,000</p> <p>Modes of payment: <u>Online transfer:</u> Account Name: CCE IIT Madras A/c No.: 36401111110 (SBI, IIT Madras Branch, Chennai) IFSC Code: SBIN0001055 (OR) <u>Demand draft</u> in favour of “CCE, IIT Madras” payable at Chennai. The demand draft is to be sent to the course coordinator at the address given below. The above fee is towards participation in the course and course materials.</p>
Accommodation	<p>The participants may be provided with hostel accommodation, depending on availability, on payment basis. Request for hostel accommodation may be submitted through the link: http://hosteldine.iitm.ac.in/iitmhostel/</p>

Course Faculty



Prof. Eliseo Ranzi received a degree in Chemical Engineering (summa cum laude) at Politecnico of Milan, Italy, in 1968. He is a Full Professor of unit operations, chemical plants, chemical reaction engineering, and combustion since 1989 at the Department of Chemistry, Material, and Chemical Engineering (Giulio Natta) of the same Politecnico. He was the Vice Chair and

the Chair of the department (1990–1998). His teaching activities are in the areas of experimental design, system analysis in chemical engineering, transport phenomena, applied chemical kinetics, chemical reaction engineering, combustion, and pollutant formation. He is the leader of the CRECK (Chemical Reaction Engineering and Chemical Kinetics) modeling group at Politecnico di Milano (<http://creckmodeling.chem.polimi.it>).

His primary research areas include pyrolysis, partial oxidation and combustion of hydrocarbon fuels, detailed and lumped kinetics of thermochemical conversion of coal and renewable fuels and surrogate molecules. He has authored over 200 peer reviewed scientific papers in international journals of repute. His papers are highly cited (~8000 citations), with H-index of 45 (Scopus). He is a co-author with Dente and Pierucci of the SPYRO Program, which is used worldwide by ethylene producing companies for over three decades.



Dr. R. Vinu is an Associate Professor in Chemical Engineering department at IIT Madras. He obtained his Ph.D. in Chemical Engineering from Indian Institute of Science, Bangalore in 2010. Before joining IIT Madras in 2012, he worked as a post-doctoral researcher in Chemical and Biological Engineering at Northwestern University, U.S.A., where

he worked on microkinetic modeling of biomass conversion to biofuels, and thermochemical conversion of polymers. His areas of research include thermochemical conversion of renewable and non-renewable feedstocks for chemicals and fuels, catalytic fast pyrolysis of biomass and plastics, microkinetic modelling of complex reactions like polymer degradation, environmental photocatalysis and process intensification. He is a Young Associate of the Indian Academy of Sciences, Bangalore (2017), and the recipient of Young Faculty Recognition Award from IIT Madras (2015). He serves on the editorial board of the Elsevier journal - Advanced Powder Technology.

Course Co-ordinator

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