

UniSysCat - Special Lecture

Prof. Dr. Sebastian C. Peter

New Chemistry Unit and School of Advanced Materials, Jawaharlal Nehru Centre for Advanced Scientific research, Bengaluru, India

Start Time: Thursday, October 24, 2024 05:15 pm

End Time: Thursday, October 24, 2024 06:30 pm

Bel 301

Carbon and Water Recycling for Sustainable Energy: A Journey from Fundamental Chemistry to Green Technologies

Prof. Dr. Sebastian C. Peter

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Two most imminent scientific and technological problems that mankind is facing now are energy and climate. The energy production and utilization in modern society is mostly based on the combustion of carbonaceous fuels like coal, petroleum and natural gas the combustion of which produces CO_2 , which alters earth's carbon cycle. 30 billion of tons of CO_2 per year get emitted globally as waste from the carbonaceous fuel burning and industrial sector, which if converted to valuable chemicals have the potential to change the economy of the world. We, in our lab, are trying to address both issues and are keen upon translating our innovative technologies from the lab to the industrial and commercial scale. In this talk, I will discuss about our recent discoveries of materials based on intermetallics, chalcogenides, oxides, organic-inorganic hybrids, etc as efficient catalysts for the conversion of CO_2 to chemicals/fuels. We are capturing CO_2 from industrial flue stream and converting it to value added chemicals/fuels such as methanol, CO, methane, dimethyl ether, C2-C5 & C5-C11 gasoline hydrocarbons. I will also cover our activities to produce green hydrogen via electrochemical pathway. The utilization of hydrogen and other fuels like methanol/ethanol through fuel cells also will be discussed. Catalyst design is at the heart of all these technologies, and we have developed customized catalyst systems for targeted product conversions as per the need of different industries. Development of these catalyst via various methods, the driving force behind the enhancement in activity and the mechanistic pathways will be explained with the support of various in-situ

(DRIFTS, IR, XAFS), ex-situ (XPS, XRD, IR, XAFS) and theoretical (DFT calculation) studies. The talk also will cover the industrial viability of these catalysts.

Dr. Majd Al-Naji

Organizer