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Catalysts, key to a sustainable future

Today's society needs to prepare itself for a more healthy future with food for all and plenty of energy and resources to fuel our growing prosperity. Chemistry is ready to take on this global challenge. In particular, catalysis is a crucial discipline when it comes to providing the scientific and technological foundation for making cleaner, efficient and economically viable chemical processes. Catalysis is the essential chemical phenomenon that underlies all living systems and is a key to creating sustainable processes and a greener environment. Catalysts accelerate chemical reactions and efficiently channel energy into building complex molecular structures. The ability to perform specific reactions with great precision through millions of cycles is the basis of sustainable processes. Thus the concepts of sustainability can be clearly illustrated using examples of natural and manmade catalytic processes. Natural catalytic cycles such as the photosynthetic production of carbohydrates are made possible through enzymes. The efficient conversion of oil, gas, coal and biomass into fuels and chemicals is made possible by modern catalytic technology. In this lecture, role of catalysis and its contribution for sustainable development of the future will be discussed. Nanotechnology may change the landscape of chemical industries. Nanomaterials are playing a significant role in diverse fields of chemistry, physics, biology and materials science. The novel physical and chemical properties of nanomaterials promise many advanced applications in the development of new energy and chemical conversion technologies. Highly selective catalysts may help reduce the energy consumption required for product separation and waste disposal processes in chemical industries. Nanostructured metal oxides are widely used in catalysis where the acidic/base properties and the catalytic activities are closely related to the size and morphology of the oxides. Reactive nanocrystalline metal oxides are newly discovered materials that could change dramatically the way these organic transformations are carried out. These high reactivities are due to high surface areas combined with unusually reactive morphologies. For the last few years, we have been exploiting the different nanocrystalline metal oxides (ex., MgO, CuO, ZnO, TiO_2 etc.,) for a number of organic reactions viz., Claisen-Schmidt, Wadsworth-Emmons, Wittig, aldol, asymmetric epoxidation, Henry, Michael and asymmetric hydrosilylation, C-H activation reactions etc. Overview of our work on nanocrystalline metal oxides based catalysts for the synthesis of fine chemicals will be presented.

Biography

Lakshmi Kantam Mannepalli was the Director of the Indian Institute of Chemical Technology and presently serving as Dr. B. P. Godrej Distinguished Professor of Green Chemistry at ICT, Mumbai. She has published more than 320 papers in highly reputed journals and serving as an Editorial Board Member of *The Chemical Record, Journal of Chemical Sciences* and *the Open Catalysis Journal*. She has more than 50 patents to her credit. Her area of interest is design and development of new catalysts and their application towards innovative green processes. She is a J. C. Bose National Fellow (DST-GOI). She is also a Fellow of National Academy of Sciences (FNASc), Fellow of Indian National Academy of Sciences (FNA) & Fellow of Royal Society of Chemistry (FRSC) for her scientific achievements in the area of catalysis.

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