TEXAS A&M UNIVERSITY at QATAR

Chemical Engineering Program Presents

Carbon supported Catalysis for Hydrotreating Oil Fractions

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Most of the commercial processes for petroleum refining or for chemical commodities manufacturing have similar problems with catalyst intra-particle diffusion limitations leading to low effectiveness factors (0.06 to 0.6), maldistribution of feedstocks streams within the catalytic beds, and radial and/or intra-particle temperature gradients. The use of slurry reactors, as an alternative, may address some of these limitations while inducing other problems such as catalyst attrition, catalyst separation, and difficulties in predicting the hydrodynamics.

The structured packings may represent a viable alternative had they offer a high surface area and a good mechanical strength. Among the systems studied in the recent years, the foams of either ceramic, metallic, carbon, or silicon carbide materials received more attention. As their surface areas are, usually, too small for commercial applications, one solution is to increase their own surface area or to grow on them carbon nanotubes (CNT) or nanofibers (CNF) with high surface area and almost exclusive mesopores. Metallic catalysts can be loaded on such supports. Among the advantages it can be mentioned the almost exclusive presence of mesopores, weak interaction with metallic catalysts, low pressure drops even at high superficial gas/liquid velocities, very low, if any, diffusion limitations, and, 100-200 times higher thermal conductivity compared with silica or alumina.

The Catalysis Group of The Petroleum Institute of Abu Dhabi is involved in developing such catalysts for hydrotreating oil fractions or crude oil, steam reforming of methane, and other processes. The catalyst preparation comprises several stages: CNF and CNT are oxidized, loaded with catalysts precursors, and activated using specific procedures. The tentative catalytic materials are screened for HDS, HDA, and HDN, or SMR reactions. At each stage the catalytic materials are characterized using BET, TPD, FT-IR, UV-Vis-NIR, TGA/DSC, XRD, SAXS, MAS-NMR, SEM.

Tests are performed using tubular microreactors BTRS-Jr (Autoclave Engineers) and chromatographs equipped with TCDs, FID, MS, or Sulfur chemiluminiscence detectors.

My talk will present some of the preliminary results of our activity.

Dr. Radu V. Vladea

Dr. Radu V. Vladea has received a MS in Chemical Engineering – Major Organic Chemical Technology, and a PhD in Chemistry – Electrocatalysis from Romanian Universities. He was a faculty member at the University "Politehnica" of Timisoara till 1994. In the meantime he was senior researcher at The Institute for Chemical and Biochemical Energy and, eventually, Director of the Institute for Chemical and Technological Sciences from 1990 to 1994, Consultant for Chemical Companies, and Expert in Chemical Processing Plant Accident Investigation, all of these in Romania. Since 1995 till 1998 he was Research Associate at the University of Waterloo, Canada, then senior scientist at Brantford Chemicals, a branch of Pharmaceutical Company Apotex in Canada. From 2000 through 2005 he was Process Technology Development Advisor at SABIC, Riyadh. Starting 2007 he is Research Professor at the Petroleum Institute in Abu Dhabi.

He has published 60 papers and 32 patents, 2 textbooks, had 14 research grants and contracts, and developed 11 pilot or demo plants.

Within the Petroleum Institute he developed Catalysis laboratories and is leading a Research Group in Catalysis, Reaction Engineering, and Process Intensification. The on-going projects are envisaging the development of new catalytic systems for intensifying hydrotreating processes, steam reforming of methane, and studies on catalysts deactivation, regeneration and re-activation.

FOR MORE INFORMATION:

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