Russell R Chianelli, J Pet Environ Biotechnol 2015, 6:5
http://dx.doi.org/10.4172/2157-7463.C1.009

OMICS International
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3rd World Congress on
Petrochemistry and Chemical Engineering
November 30-December 02, 2015 Atlanta, USA

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Catalytic materials from theory and synthesis to commercialization

The recent development of commercial software able to determine or predict catalytic activity, has led to commercialization and potential commercialization of the TMS catalytic materials. Additionally, we have developed a fundamental understanding of the catalytic materials. This report will describe how the following interdisciplinary scheme has been applied to the TMS catalytic materials. Shell Oil after WWII commercialized unsupported TMS catalytic materials but these were soon replaced for commercial reasons with the currently popular Al_2O_3 supported catalysts. In the 1970's, researchers concluded incorrectly that, the Al_2O_3 was fundamentally involved in the "Promotion Effect". This effect today is understood in detail as the sharing of non-bonding d electrons in clusters that mimic noble metal for example $Co_9S_8 + MoS_2$. This result we call "Goldilocks" which will be discussed during the report. New TMS catalysts are developed through theory, synthesis, characterization, and then the use of model reactions comes. In our case we have used the HDS of dibenzothiophene as our model reaction and over the years, it predicts accurately, behavior in real petroleum feeds and rapidly screens catalysts for real feed tests. Behavior in real feeds is required to move closer to commercialization. In the case of the TMS we have three different exciting real feed results and our catalysts are being commercialized. Another commercial task is to scale-up from laboratory quantities (grams) to sale quantities (pounds–tons). New issues are often involved and commercialization requires the following teamwork.

Biography

Russell R. Chianelli is currently Director of the Materials Research and Technology Institute at the University of Texas at El Paso and Professor of Chemistry, Materials and Environmental Science and Engineering. After receiving his PhD, he joined the Corporate Research Laboratories of Exxon Research and Engineering Co in 1974. While at this laboratory he conducted research in both fundamental and applied areas of interest to the energy industry. He is recognized worldwide for his work in Transition Metal Sulfide environmental catalytic materials. This work resulted in over 130 publications and 60 issued United States patents. During this period he was active in the Materials Research Society (MRS), serving as vice president (1989), president (1990), past president (1991) and Counselor (1992-1994). In 1996 he joined the Chemistry Department at the University of Texas at El Paso as Chairman and Professor of Chemistry and Environmental Sciences. In 2001 he resigned as Chemistry Department Chairman to head the Materials Research and Technology Institute (MRTI) at UTEP. The MRTI is dedicated to research relevant to the US/Mexico border in Materials related to energy, environment and health.

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