

## Petrochemistry and Chemical Engineering 2015: Catalytic materials from theory and synthesis to commercialization- Russell R Chianelli- The University of Texas at El Paso

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### **Abstract:**

The recent development of economic software ready to determine or predict catalytic activity, has led to commercialization and potential commercialization of the TMS catalytic materials. Additionally, we've developed a fundamental understanding of the catalytic materials. This report will describe how the subsequent 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<sub>2</sub>O<sub>3</sub> supported catalysts.

within the 1970's, researchers concluded incorrectly that, the Al<sub>2</sub>O<sub>3</sub> was fundamentally involved within the "Promotion Effect". This effect today is known intimately because the sharing of non-bonding d electrons in clusters that mimic metallic element for instance Co<sub>9</sub>S<sub>8</sub> + MoS<sub>2</sub>. This result we call "Goldilocks" which can be discussed during the report. New TMS catalysts are developed through theory, synthesis, characterization, then the use of model reactions comes. In our case we've 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 maneuver closer to commercialization.

Chemical engineering could also be a branch of engineering that uses principles of chemistry, physics, mathematics, biology, and economics to efficiently use, produce, design, transport and transform energy and materials. The work of

chemical engineers can range from the utilisation of nano-technology and nano-materials within the laboratory to large-scale industrial processes that convert chemicals, raw materials, living cells, microorganisms, and energy into useful forms and products.

Chemical engineers are involved in many aspects of plant design and operation, including safety and hazard assessments, process design and analysis, modeling, control engineering, reaction engineering, engineering, biological engineering, construction specification, and instruction manual.

Chemical engineers typically hold a degree in Chemical Engineering or Process Engineering. Practising engineers may have professional certification and be accredited members of knowledgeable body. Such bodies include the Institution of Chemical Engineers (IChemE) or the American Institute of Chemical Engineers (AIChE). A degree in chemical engineering is directly linked with all of the other engineering disciplines, to varied extents. Chemical engineering design concerns the creation of plans, specification, and economic analyses for pilot plants, new plants or plant modifications. Design engineers often add a consulting role, designing plants to satisfy clients' needs. Design is restricted by sort of things, including funding, government regulations and safety standards. These constraints dictate a plant's choice of process, materials and equipment.

Plant construction is coordinated by project engineers and project managers relying on the size of the investment. A chemical engineer may do

the work of project engineer full-time or a neighborhood of the time, which needs additional training and job skills or act as a consultant to the project group. within the USA the education of chemical engineering graduates from the Baccalaureate programs accredited by ABET don't usually stress project engineering education, which may be obtained by specialized training, as electives, or from graduate programs. Project engineering jobs are a number of the most important employers for chemical engineers.

Chemical engineers could also be involved in industry or university research where they're tasked with designing and performing experiments to make better and safer methods for production, pollution control, and resource conservation. They'll be involved in designing and constructing plants as a project engineer. Chemical engineers serving as project engineers use their knowledge in selecting optimal production methods and plant equipment to attenuate costs and maximize safety and profitability. After plant construction, chemical engineering project managers could even be involved in equipment upgrades, process changes, troubleshooting, and daily operations in either full-time or consulting roles

Chemical process modeling could also be a computer modeling technique utilized in chemical engineering process design. It typically involves using purpose-built software to define a system of interconnected components, which are then solved in order that the steady-state or dynamic behavior of the system are often predicted. The system components and connections are represented as a process flow chart. Simulations are often as simple because the blending of two substances during a tank, or as complex as a whole alumina refinery.

Chemical process modeling requires a knowledge of the properties of the chemicals involved within the simulation, also because the physical

properties and characteristics of the components of the system, like tanks, pumps, pipes, pressure vessels, and so on. Within the case of the TMS we've 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 subsequent 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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