



The Gene and Linda Voiland School of
Chemical Engineering and Bioengineering
2015 Seminar Series
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1:30-2:30 p.m. Wegner G1



Enrique Iglesia
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Enrique Iglesia is the Theodore Vermeulen Chair in Chemical Engineering at the University of California, Berkeley, a faculty senior scientist at the Lawrence Berkeley National Laboratory, and director of the Berkeley Catalysis Laboratory. Professor Iglesia has been involved in studies of heterogeneous catalysts for the direct and indirect conversion of methane to higher hydrocarbons, uses of light alkanes in desulfurization and de-NO_x reactions, dehydrogenation of light alkanes to alkenes and aromatics, catalytic reforming and cracking processes, for low-temperature isomerization, alkylation, and combustion reactions. Current research projects also include the practical use of catalytic membranes to combine reaction and separation functions in alkane dehydrogenation and conversion processes and the development of theoretical methods for predicting the structure, transport, and chemical properties of porous solid catalysts. His research group at Berkeley combines expertise and facilities for the synthesis of novel catalytic solids, their in-situ structural and mechanistic characterization, and the detailed modeling of kinetic and transport processes in catalytic processes relevant to oil refining and petrochemical synthesis. He has coauthored more than 300 publications and 40 U.S. patents.

The Chemistry and Engineering of C1 Molecules: Methane Conversion and Beyond

The recurring need for advantaged feedstocks as precursors to chemicals and fuels brings us once again to scientific and engineering matters pertaining to the conversion of molecules without any C-C bonds (methane, methanol, dimethyl ether). Such C1 molecules, especially methane, present thermodynamic and kinetic challenges that bring significant complexity and costs into their chemical transformations. We gather here some unifying concepts and, in doing so, provide guidance about the most attractive C1 conversion strategies. These concepts include (i) thermodynamic constraints and the limitations of catalysis in circumventing them; (ii) the pre-eminence of process simplicity and inexpensive oxidants over the allure of direct conversions; (iii) principles of kinetic and thermodynamic protection; (iv) the coupling of separations with reactions and of multiple catalytic functions; (v) the prevalence of kinetic bottlenecks in forming the first C-C bond; and (vi) the emergence of a C2 conversion platform as we overcome (or accept) the limits of C1 chemistries. The conclusions are sobering, as the magnitude of the challenge so warrants.