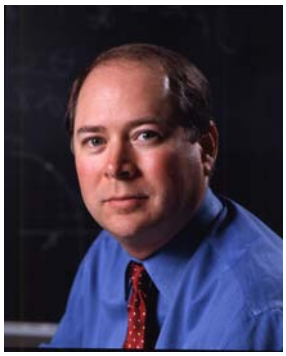
**JMU Chemistry and Biochemistry Seminar**
Friday, September 26, 2014
3:35pm in ISAT 159



# Transformations of Alcohols over Solid Catalysts

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Alcohols can be easily produced from a variety of carbon sources such as biomass, natural gas, coal and petroleum. In this talk, the subsequent transformation of alcohols via catalytic oxidation to acids or via Guerbet-type coupling to longer chain alcohols will be discussed. Gold is well-recognized as a selective catalyst for alcohol oxidation in liquid water, but added base is needed to promote high reaction rates at low temperature. Platinum is also a selective catalyst for alcohol oxidation but does not require added base to function effectively at low temperature. The kinetics and mechanism of alcohol oxidation over Au and Pt catalysts will be explored for such probe molecules as ethanol, glycerol, 5-hydroxymethylfurfural and 1,6-hexanediol, emphasizing the similarities and differences between the behavior of the two metals and the trends involving the type of alcohol being oxidized. The presentation will conclude with a discussion of recent isotopic transient studies and infrared spectroscopy results of ethanol coupling reactions to produce butanol. The so-called Guerbet coupling of ethanol requires multifunctional base catalysts that facilitate ethanol dehydrogenation, aldol condensation, and hydrogenation. Although magnesia catalyzes the Guerbet coupling reaction, hydroxyapatite is much more active and selective, presumably because of its more appropriate balance of Lewis acidity and basicity.

## Short Biography of Robert Davis

Robert Davis obtained his Ph.D. degree in Chemical Engineering from Stanford University in 1989. He subsequently worked as a postdoctoral research fellow in the Chemistry Department at the University of Namur in Belgium. He joined the faculty in Chemical Engineering at the University of Virginia in 1990 as an assistant professor, was promoted to associate professor in 1996, full professor in 2002, and Earnest Jackson Oglesby Professor in 2009. Professor Davis also served as the Chair of Chemical Engineering at the University of Virginia from 2002 to 2011. He received the Emmett Award of the North American Catalysis Society, the NSF Young Investigator Award, the DuPont Young Professor Award, the Union Carbide Innovation Recognition Award, and the UVa Rodman Scholars Award for Excellence in Teaching. Professor Davis has co-authored more than 100 publications, 1 patent and 1 textbook, entitled “Fundamentals of Chemical Reaction Engineering”. He has delivered over 100 invited lectures at conferences, academic departments and industrial research groups, and has co-authored over 100 additional presentations at technical meetings. Professor Davis has served as President of the Southeastern Catalysis Society, Chair of the 2006 Gordon Research Conference on Catalysis, Chair of Catalysis Programming of the AIChE, Chair of a US government panel charged with worldwide assessment of Catalysis by Nanostructured Materials, Director of the Catalysis and Reaction Engineering Division of the AIChE, Director of the North American Catalysis Society, Co-Chair of an International Catalysis Workshop in China, member of the Advisory Board of the International Conferences on Solid Acid and Base Catalysis, and member of the editorial boards of *Journal of Catalysis*, *Applied Catalysis A* and *B*, *Journal of Molecular Catalysis A*, *ChemCatChem* and *ACS Catalysis*.