The CATALYSIS SOCIETY of Metropolitan New York
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Wednesday, April 9, 2014
Somerset-Bridgewater Hotel, Somerset, New Jersey
(Formerly Crowne Plaza Hotel)

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Supported catalysts: does surface roughness matter? A case study with in VO_x-SBA-15

Template-synthesized mesoporous silicates such as MCM-41 and SBA-15 have found extensive use as a model supports for studies of supported catalysis [1, 2]. For SBA-15, thorough structural analyses clearly describe the dual micropore-mesopore structure with a broad distribution of micropore sizes [3]. Silicas such as SBA-15 have long been considered a relatively inert support, quite in contrast to other oxides such as titania or ceria. We find the effect of surface roughness of SBA-15 has an underappreciated effect on catalyst performance. Specifically, samples of VOx-SBA-15 where the support surface roughness was systematically varied were tested in the catalytic partial oxidation of methanol to formaldehyde as well as propane to propene. SBA-15 supports with smoother surfaces favor the formation of more polymeric vanadia species at the same surface density loading, and catalysts formed on these smooth-surface supports result in a ~20% lower selectivity of methanol to formaldehyde. Furthermore, the apparent activation energy on smooth surfaces is ~25 kJ/mol lower than on rough surfaces. In distinct contrast to methanol, propane partial oxidation results show a 15% higher selectivity to propene on smooth surfaces. A model of silica hydroxyl distribution is proposed to explain the differences in vanadia speciation and resulting differences in catalytic behavior. These results are significant with respect to our our understanding of the precise nature of vanadium species in partial oxidation catalysts, and illustrate the importance of considering differences in support surface morphology in analyzing catalytic behavior. Surface morphology is often neglected in the catalysis world, but is very important for other surface chemistry applications. This is the next logical step in understanding the synthesis-structure-activity relationships of real catalysts!

References

[1] V. Dufaud, M. E. Davis, J. Am. Chem. Soc. 125 (2003) 9403-9413.
[2] R. K. Zeidan, S. J. Hwang, M. E. Davis, Angew. Chem.-Int. Edit. 45 (2006) 6332-6335.
[3] M. Kruk, M. Jaroniec, R. Ryoo, J. M. Kim, Chem. Mat. 11 (1999) 2568-2572.

Dinner is a buffet, and includes		Members	**$40**
a choice of beef, chicken or fish		Non-members	**$50**
Social Hour (Cash Bar)	6:00 PM	Students	**$25** (***Student Members = $10***)
Dinner	7:00 PM	Retired/Post-Doc/ Unemp.	**$40** (***Members = $30***)
Presentation	7:45 PM	Annual Dues	**$35 (Student/Retired = $15)**

Deadline for dinner reservations is **2:00 p.m. Friday, April 4, 2014**

Email Zhong He (zhe@primusge.com) for reservations. With the exception of extreme circumstances, anyone not canceling reservations by the above deadline will be billed for dinner regardless of attendance.
