Charlie Sykes

OU Chemical Biochemical & Materials Engineering/Physics and Astronomy Schedule
Wednesday/Thursday 27/28 Apr 2016

Wednesday: Pick up at airport 19:30 Wed (27 Apr 2016) by Bumm

Flight	UA1233	BOS	13:06	IAH	16:29
	UA6096	IAH	17:54	OKC	19:25

accommodations:

Wed-Fri: Montford Inn, 322 West Tonhawa, Norman, OK 73069
Phone: 405.321.2200/800.321.8969 FAX 405.321.8347
Trophy Room (conf # 73856)

Wednesday 27 Apr 2016

20:00 Dinner

Thursday 28 Apr 2016

8:30 Bumm (pick up from Montford Inn)

8:45 Bumm

9:30 Uchoa

10:00 Santos

10:30 Shaffer

11:00 Sellers

11:45 lunch at Pepe's

13:30 Bin Wang (SEC T223)

14:00 Steven Crossley (SEC T319)

14:30 Paul Liangliang Huang (SEC T219) (bring to Nielsen Hall)

15:10 Erin Iski (NH123)

15:30 Tea (NH Atrium)

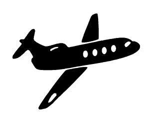
16:00 Colloquium (NH 170)

17:15 Bumm Group

18:00 dinner at Benvenuti's

Friday 29 Apr 2016

Airport Express Shuttle to airport: Pick up at Montford: 05:00 (405-681-3311 conf# 315843)



Flight	AA0157	OKC	07:00	DFW	08:04
	AA-176	DFW	10:20	BOS	15:00

Joint Colloquium
Chemical Biological & Materials Engineering
+
Physics & Astronomy

16:00 Thu 28 Apr 2016 (NH170)

AN ATOMIC PICTURE OF NUCLEAR DECAY IN STABLE 2D RADIOACTIVE FILMS

Charlie Sykes

Department of Chemistry
Tufts University,
Medford, MA 02155, USA

While macroscopic radioactive decay is well understood and has been utilized for decades; nanoscale effects of radioactive decay have barely been explored. We have synthesized one atom thick films of radioactive iodine-125 on gold that are stable in ambient conditions and can be handled safely. STM supported by simulation shows the atomic-scale structure of the films and the appearance of individual atoms of tellurium-125, the radioactive decay product. Using XPS we have verified the chemical composition of our samples and characterized the oxidation of daughter tellurium atoms. Electron spectroscopy reveals a multitude of low energy secondary electrons from the decay process. These lower energy electrons are the main drivers of radiation-induced chemical reactions, biological damage and radiation therapy. Therefore, 2D radioactive films offer a platform for understanding the microscopic details of these processes. Furthermore, the geometry of metal-supported 2D films more than quadruples the secondary electron yield making patterned monolayer films or coated nanoparticles spatially well-defined sources of higher intensity, tunable secondary electrons.

Biography for Charles Sykes

E. Charles H. Sykes is a Professor of Chemistry at Tufts University. Charles got a first class B.S. and M.S. from Oxford University before moving to Cambridge University for a Ph.D. under the supervision of Professor Richard Lambert. His thesis work explored the structure and reactivity of model gold/titania catalysts. He then relocated to the U.S. for postdoctoral fellowships with Professor Paul Weiss at Penn State and Professor Mike Fiddy at the University of North Carolina at Charlotte. His postdoctoral studies were the first to directly image and control the placement of catalytically important subsurface hydrogen in palladium. In 2005 Charles began his independent career as an Assistant Professor of Chemistry at Tufts University.

Sykes has since been named a Beckman Young Investigator, Research Corporation Cottrell Scholar, IUPAC young observer and the Usen Family Career Development Professor. He was the recipient of a 2009 NSF CAREER award, a 2011 Camille Dreyfus Teacher-Scholar Award and the 2012 AVS Peter Mark Memorial Award. Charles received the Young Talented Scientist Award at Chirality 2014 and was named a Fellow of the Royal Society of Chemistry in 2015. He is the author of over 100 peer-reviewed publications and has given over 120 invited talks at conferences and universities.

The Sykes group utilizes state of the art scanning probes and surface science instrumentation to study fundamentally and technologically important systems. For example, scanning tunneling microscopy enables visualization of the geometric and electronic properties of catalytically relevant metal alloy surfaces at the nanoscale. Using temperature programmed reaction studies of well-defined model catalyst surfaces structure-property-activity relationships are drawn. The Sykes group recently demonstrated how single palladium atoms can convert the otherwise catalytically inert surface of an inexpensive metal into an ultraselective hydrogenation catalyst. The mechanism involves facile dissociation of molecular hydrogen at individual palladium atoms followed by spillover onto the copper surface, where ultraselective catalysis occurs by virtue of weak binding. The reaction selectivity is in fact much higher than that measured on palladium alone, illustrating the unique synergy of the system.

In the area of molecular motors, the Sykes group has demonstrated the world's first single molecule electric motor. Electrons from a scanning tunneling microscope tip were used to drive the directional motion of a thioether molecule on a copper surface. Surprisingly, the direction and rate of the rotation turned out to be related to the chirality of both the molecule and the tip of the microscope (the electrode), illustrating that the exact geometry and chirality of electrical contacts to molecules can have a large influence on excitation probability, a fact overlooked in all nanoscale electrical devices to date.