Supporting Information

Somorjai and Li 10.1073/pnas.1006669107

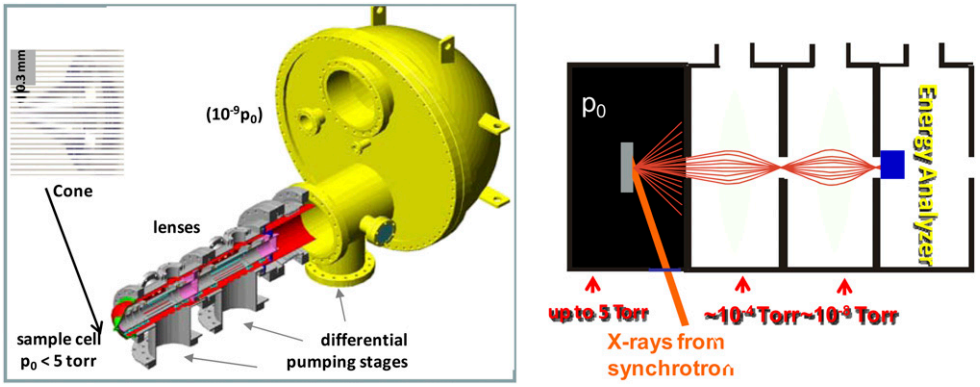

Fig. S1. Scheme of the photoelectron detector used in AP-XPS technique.

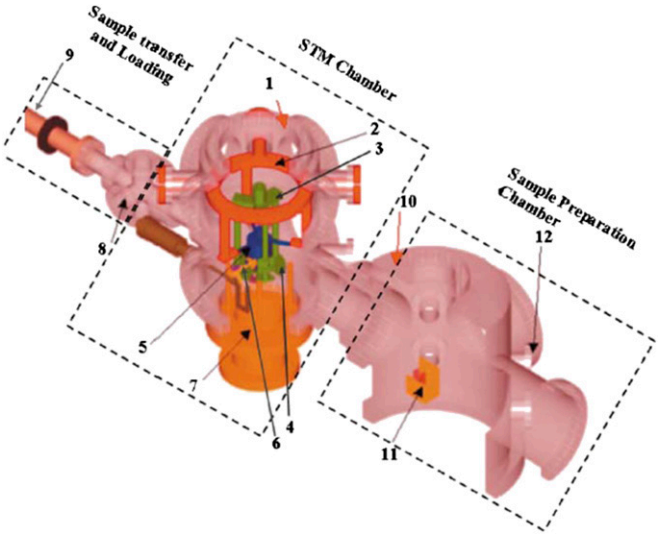

Fig. S2. Scheme of a recent designed HP-STM experiment system: 1, view window; 2, mounting framework; 3, docking scaffold; 4, docking disk; 5, high pressure reactor (STM body housed within); 6, bayonet seal; 7, guide rod of docking scaffold; 8, sample/tip load-lock system; 9, transfer rod; 10, gate valve; 11, four-finger sample stage; 12, sputtering ion gun.

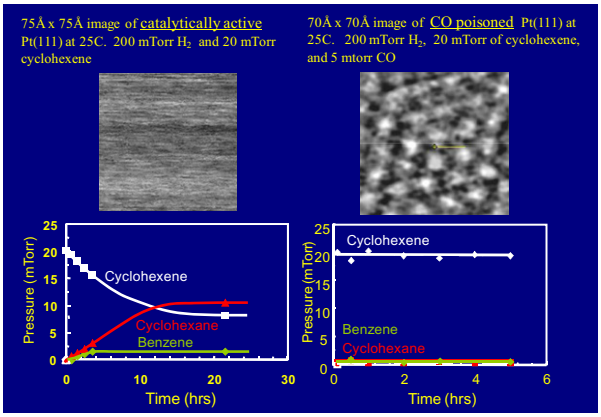

Fig. S3. The correlation between the mobility of adsorbates and the reaction turnover rate during the hydrogenation/dehydrogenation of cyclohexene over the Pt(111) surface.

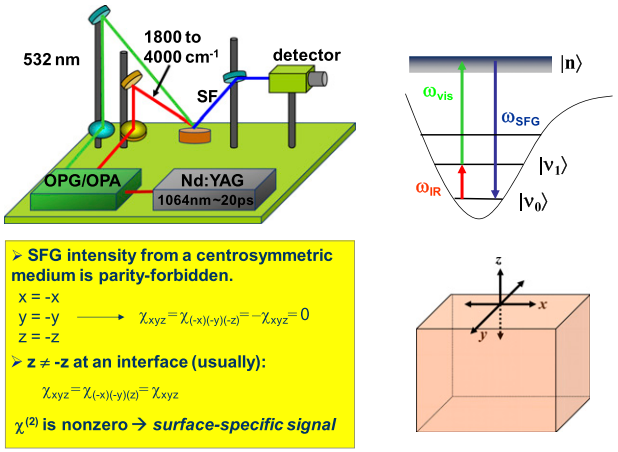

Fig. S4. Scheme for the experimental setup and the operating principle of SFG.

Table S1. Several major technological applications of surface chemistry

Application	Related fields in surface chemistry	Economic impart
Heterogeneous catalyst technology	Synthesis of nanoparticles and high surface area supports. Surface structure and reaction dynamics characterization at gas–solid and liquid–solid interfaces.	More than 80% of the current industrial processes in the chemical, petrochemical, and biochemical industries, as well as in the production of polymers and in environmental protection, use catalysts. In the US alone, the annual value of products manufactured with the use of catalysts is on the order of $1 trillion (143). In 2008, the turnover in the catalysts world market was estimated to be ≈$13 billion (144).
Semiconductor-based technology	Epitaxial growth of device quality semiconductor thin film. Metallization via vapor deposition. Patternwise deposition and etching of oxides and resists. Surface analysis for device and process characterization.	In 2005, the semiconductor industry made >90 million transistors for every man, woman, and child on Earth, and by 2010, this number should 1 billion transistors. In 2009, worldwide sale of semiconductor chips was $226 billion.*
Medical technology	Organofunctionalization of surfaces. Biological recognition at surfaces. Surface characterization of specific and nonspecific adsorption of biomolecules and cells on surfaces.	The biosensors market is projected to reach $6.1 billion by 2012. In 2009, the US implantable medical devices market was about $33 billion. In 2003, the annual contact lens sales in the US market were estimated to range from $1.95 billion to $3.5 billion. Recent data indicate that nearly 36 million Americans—almost 13% of all Americans—wear contact lenses.†
Anticorrosion technology and	Corrosion chemistry: electrochemistry on metal surfaces and polymer degradation.	In industrialized countries, the cost of corrosion is estimated to be ≈3.5% of the gross national product (68). In 2005, the US protective coating market was estimated to be more than $10.7 billion.
Lubricant technology	Tribology, science of friction, wear, and lubrication.	Global lubricant demand is forecast to reach 40.5 million tons in 2012. The worldwide lubricant industry was estimated to be more than $48.8 billion in 2009.

*Semiconductor Industry Association (2010) Industry Fact Sheet. Retrieved from http://www.sia-online.org/cs/industry_resources/industry_fact_sheet.
†Federal Trade Commission (2003) "Prepared Statement of The Federal Trade Commission." Retrieved from http://www.ftc.gov/os/2003/09/contactlens.shtm#N_3_.