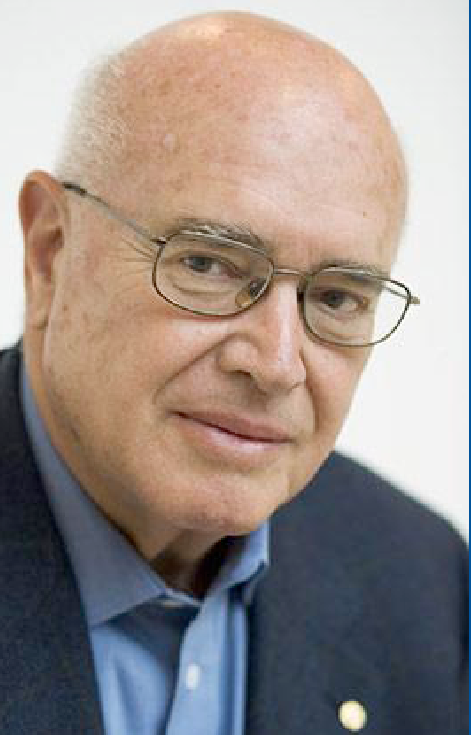

COLLÈGE DE FRANCE 1530

GABOR A. SOMORJAI
University of California, Berkeley and Lawrence Berkeley National Laboratory

INTEGRATION OF SELECTIVE HETEROGENEOUS, HOMOGENEOUS AND ENZYME CATALYSIS ON THE NANOSCALE

vendredi 2 octobre 2015 à 11heures
Salle 2

Biography

Gabor A. Somorjai (born May 4, 1935) is a professor of Chemistry at the University of California, Berkeley and is a leading researcher in the field of surface chemistry and catalysis. He is the author of more than 1000 scientific papers. For his contributions to the field, Somorjai won the Wolf Prize in Chemistry (1998), the Linus Pauling Award (2000), the Priestley Medal (2008), the ENI New Frontiers in Hydrocarbons Award (2011) and more recently the ACS's William H. Nichols Medal (2015). He received his Ph.D. degree in Chemistry from the UC Berkeley in 1960. In 1972, he was promoted to Professor. He is also a Faculty Senior Scientist in the Materials Sciences Division, and Group Leader of the Surface Science and Catalysis Program at the Center for Advanced Materials, at the E.O. Lawrence Berkeley National Laboratory.

Abstract

Catalysts, heterogeneous, homogeneous and enzyme, are nanoparticles. They are working in various chemical environments, either in the gas-solid interfaces, or liquid (organic or water) interfaces. These catalysts have developed along separate lines because of the conditions of their applications. However, development of nanomaterial science, because of the needs of technology such as the diminishing sizes of transistors in the integrated circuitry, and the need for one hundred percent selectivity of chemicals for energy conversion or human health, has brought in the knowledge of nanoscience that is necessary to combine the three fields of catalysis. In this seminar I plan to describe that the integration has many ingredients :

1. The availability of low coordination sites or relatively weak bonding permits dynamic turnover.
2. Studies of transition metals indicate the dominance of covalent molecular bonds in many catalytic reactions.
3. Development of instruments that permit in-situ studies under dynamic reaction conditions on the molecular scale.
4. The oxide-metal interfaces as a medium for evolution of charges, ions and electrons, as well as protons provide the foundation for acid-base catalysis.
5. Studies of model reactions prove the importance of covalent catalysis on metals, as well as acid-base catalysis at oxide-metal interfaces. The turnover rate and selectivity are key ingredients of catalysis for high throughput and one 100% selective chemistry.
6. Conversion of homogeneous to heterogeneous catalysis became possible by the change of electronic structures as the metal nanoparticles become smaller (< 2 nm) and the bulk atoms disappear.
7. Catalytic architectures, several catalysts working in series, or in parallel, are needed to understand enzyme catalysis with its complexity and extraordinary selectivity.

These ingredients of the integration process among the three fields of catalysis will be discussed and demonstrated.

Salle 2
11, place Marcelin-Berthelot, 75005 Paris
www.college-de-france.fr

L'Administrateur du Collège de France
Alain PROCHIANTZ