Carbon-Supported Catalysts: A TEM Study

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The key issue for the rational design of novel high-performance catalyst with low cost and long life time is the knowledge about the activity-structure correlation at the atomic scale. Electron microscopy techniques are very powerful and versatile research tools with which to investigate directly the local structure and chemistry of complex heterogeneous catalysts from the macroscopic to the atomic level. Constructing models of the structure and mechanism of the changing reactions over complex catalysts needs more precise pictures of the process at nanometer range.

Carbon is an interesting and most important element constituting materials by varying its hybridization character. Besides the classic sp^3 bonded carbon such as diamond, there is a lot of carbon materials with delocalized pi bonding character ranging from the traditional carbons (e.g. soot, charcoal, graphite….) over various novel carbon fibers, pyrolytic carbons and macromolecular or nanostructured carbon, fullerence and carbon nanotubes. Carbon is traditionally used as catalyst-support in catalysis. However, a huge of efforts has been made in the last years to use all this kind of carbon materials for hydrogen storage, fuel cell, or even as active catalyst.

In this presentation, case studies using atomic-resolution transmission electron microscopy for directly probing the catalyst-carbon (metal-support) interaction will be discussed addressing the fundamental issues of the materials and processes in catalysis.

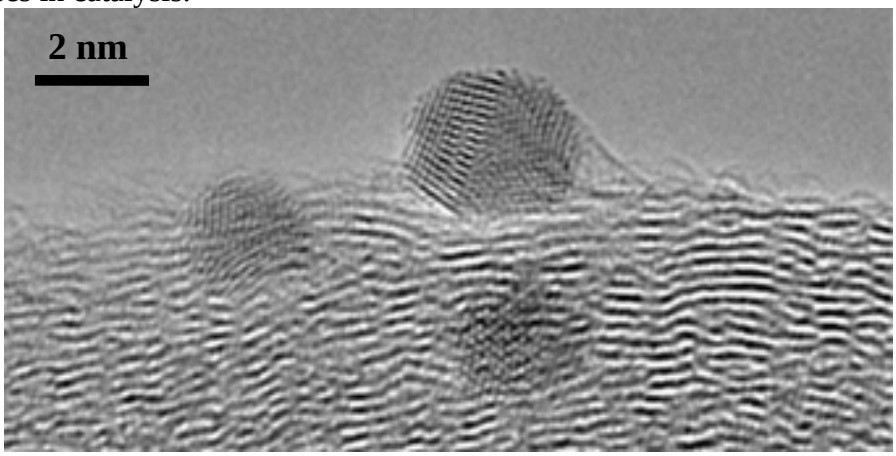

Fig. 1 High-resolution image of Au catalysts supported on carbon nanotube.

Examples of the supported catalysts (Au, Pt, Ru Pd) on actived carbons and carbon nanotubes for the selective oxidation of hydrocarbon, for liquid phase reaction, and as electrodes for fuel cell applications will be presented.