FOXSI
Functional Oxide Surfaces and Interfaces

EINLADUNG

zum Vortrag
von

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Adsorption, absorption and reaction of hydrogen at Pd-based alloy surfaces

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Abstract:

Hydrogen is a clean energy source, and hydrogen generation, storage and utilization are of crucial importance in our future society. Since solid surfaces play important roles in these processes, our group has focused on the studies of hydrogen interaction with metal and metal oxide surfaces. For this purpose, we have developed nuclear reaction analysis (NRA) that allows for high-resolution depth profiling of hydrogen and resonance-enhanced multiphoton ionization (REMPI). Pd is a typical material that absorbs hydrogen in its bulk, and hydrogen absorbed in Pd clusters was shown to play an essential role in olefin hydrogenation reactions. On the other hand, alloying with Au has been claimed to enhance hydrogen absorption in Pd. By combining NRA and TPD, we have studied absorption of hydrogen in Pd(110) and Pd70Au30(110), and shown that hydrogen can be efficiently absorbed in Pd70Au30(110). When CO is coadsorbed on these surfaces, furthermore, it was found that CO blocks the entrance/exit site of hydrogen at Pd70Au30(110) acting as a molecular cap. We also investigated the effects of absorbed hydrogen on the reactions of butene (C4H8) adsorbed on these surfaces. Whereas coadsorption of C4H8 with surface H on Pd(110) revealed no hydrogenation reaction, hydrogenated products of C4H10 were clearly observed in presence of H in the absorbed state. When C4H8 was adsorbed on the D-absorbed Pd70Au30(110) surface, on the other hand, TDS showed no hydrogenated products of C4H10, which is in contrast with the Pd(110) surface. Instead of the hydrogenation reaction, H-D exchange reactions were clearly observed. We discuss the reaction mechanisms on these two surfaces.

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