TEM investigation on the defect structures of molybdenum oxides

Dang Sheng Su*, Di Wang, Robert Schlögl

Department of Inorganic Chemistry, Fritz-Haber Institute of the Max-Planck Society,

Faradayweg 4-6, Berlin, D-14195, Germany

Although it is well known that heterogeneous catalysis is a process at the gas/solid interface and therefore it belongs to the surface science, but the bulk of catalyst has drawn more attention in the past. This is not only due to the fact the bulk determine the structure of the surface, but also due to the fact that lattice atoms are believed to be incorporated in the catalytic process. For instance, in many catalytic reactions using MoO_3 as a catalyst, lattice oxygen can be incorporated into the products leaving the catalyst reduced. Planar defects such as array of vacancies, cluster defects such as non-stoichiometric or sub-oxides are expected. The open question is, are the defects the driving force for the catalytic reaction or its by-products? As the first attempt to answer the question, we use high-resolution TEM, supported by EELS, EDS and image simulation, to study the defect structures of molybdenum oxides. As references, we start at first with the microstructural characterisation of well-defined sub-oxides $Mo_{18}O_{52}$ and Mo_8O_{23}. Works on the defect mechanism in molybdenum oxides during hydrogen reduction and during thermal decomposition will be presented.

*corresponding author: Tel.: ++49 30 8413 5406
Fax: ++ 49 30 8313 4401
Email: dangsheng@fhi-berlin.mpg.de