Contribution ID: **64** Type: **Oral contribution**

In-situ study of ceria and hydrogen interaction: Simultaneous X-ray spectroscopies and grazing-incidence X-ray scattering

Thursday, 8 December 2022 15:00 (20 minutes)

Ceria catalysts present a great potential for the selective hydrogenation of alkynes to alkenes and the hydrogenation of carbon dioxide to methanol. Recent works suggest that the type of surface and subsurface hydrogen may play an important role, affecting both the activity and the selectivity in hydrogenation reactions. Interaction with hydrogen go typically through two routes: homolytic dissociation to form two hydroxyls and heterolytic route to form hydride and a proton, although other pathways are possible. The hydrides are stabilized by oxidizing the cerium atoms next to the oxygen vacancies.

Using simultaneous X-ray photoelectron spectroscopy, X-ray absorption spectroscopy, and grazing incidence resonant X-ray scattering measurements at ambient conditions, we aim to understand both the structural and chemical changes occurring during reduction, oxidation, and interaction with hydrogen. We measured anomalous/resonant X-ray scattering at Ce L5 edge to distinguish between Ce+4 or Ce+3 species revealing dramatic changes in shape of the form factor. X-ray photoelectron spectroscopy shows that the surface was most oxidized when annealed in the H2 atmosphere, suggesting formation of hydrides. Ceria can expand through the process, and this volumetric change can be observed in diffraction measurements. Correlation of all the simultaneously acquired spectral and diffraction data gains novel insights of the ceria-H2 system.

if "Other", please specify:

I apply for a travel grant

Yes

Primary author: BEN YAACOV, Adva (weizmann institute)

Co-authors: Dr EREN, Baran (Weizmann Institute of Science); Dr FALLING, Lorentz (Advanced Light Source); NEMŠÁK, Slavomir (Advanced Light Source, Lawrence Berkeley National Laboratory)

Presenter: BEN YAACOV, Adva (weizmann institute)

Track Classification: Surface science/chemistry