



Abstract ID : 32

Evolution of active species in ethylene epoxidation over silver foil revealed by ambient pressure X-ray photoelectron spectroscopy

Content

The ethylene epoxidation (EPO) is one of the most important industrial catalytic reactions and silver-based catalysts have outstanding activity and selectivity. Silver-based model catalysts (foils, powder, single crystals) have been extensively used to investigate the fundamental steps of EPO. It has been widely proven that surface oxygen species participate in the catalytic cycle and their property is a key factor in the selectivity toward ethylene oxide. However, the nature of oxygen species and their roles in EPO are still unclear. In the current work, silver foils were characterized systematically as the starting step of a project aiming at the in situ investigation of chemical looping EPO. Ambient pressure X-ray photoelectron spectroscopy was used to investigate the effects of temperature and gas environment under both steady state and transient condition experiments. Three types of oxygen species, correlated with different structures of AgO_x, were unveiled on Ag foil. All of them proved to be highly sensitive to the temperature and ratio of reagents, and participate in the reaction with ethylene. The key role of subsurface oxygen species was revealed over silver foil during the EPO process. Dichloroethane was cofed at a ppm level in order to investigate the significant effect of chlorine on the selectivity of ethylene oxide.

Primary author: GUO, Man (ETH Zurich and PSI)

Co-authors: VAN BOKHOVEN, Jeroen (ETH Zurich and PSI); ARTIGLIA, Luca (Paul Scherrer Institut)

Presenter: GUO, Man (ETH Zurich and PSI)

Track Classification: Catalysis