

DSL2019

*15th International Conference on Diffusion in Solids and Liquids
ATHENS (Greece) from 24-28 June, 2019*

Atomic-resolution surface evolution of catalysts

Jun Luo, Yi Ding

Center for Electron Microscopy and Tianjin Key Laboratory of Advanced Functional Porous Materials,
Institute for New Energy Materials & Low-Carbon Technologies, School of Materials Science and
Engineering, Tianjin University of Technology, Tianjin 300384, China

The characterization to reveal the atomic structures of materials and their elemental distribution in each atomic column is enabled by aberration-corrected scanning transmission electron microscopy (STEM) with high-current-density electron beams and advanced detectors of energy-dispersive X-ray spectroscopy (EDS) or electron energy loss spectroscopy (EELS). This methodology has been successfully used to characterize the atomically resolved distribution and evolution of compositions in material interiors, which is a significant breakthrough. Recently, we have also utilized the atomic-resolution mappings of EDS and EELS together with atomic-resolution HAADF (high-angle annular dark field) imaging to reveal the elemental distributions in surfaces of electrocatalysts and photocatalysts, in which the individual crystal lattice of each element on the surfaces and their epitaxial growth mode have been clearly demonstrated. Further, the evolution of the surface atomic structures of electrocatalysts during electrochemical processes has been revealed and monitored at atomic scale. Based on the above results, we have achieved electrocatalysts and photocatalysts with high activity and high durability. These works give new insights into atomic structures of catalyst surfaces and their performances.