

Highly Dense Isolated Metal Atom Catalytic Sites - DTU Orbit (08/11/2017)

Highly Dense Isolated Metal Atom Catalytic Sites: Dynamic Formation and In Situ Observations

Atomically dispersed noble-metal catalysts with highly dense active sites are promising materials with which to maximise metal efficiency and to enhance catalytic performance; however, their fabrication remains challenging because metal atoms are prone to sintering, especially at a high metal loading. A dynamic process of formation of isolated metal atom catalytic sites on the surface of the support, which was achieved starting from silver nanoparticles by using a thermal surface-mediated diffusion method, was observed directly by using in situ electron microscopy and in situ synchrotron X-ray diffraction. A combination of electron microscopy images with X-ray absorption spectra demonstrated that the silver atoms were anchored on five-fold oxygen-terminated cavities on the surface of the support to form highly dense isolated metal active sites, leading to excellent reactivity in catalytic oxidation at low temperature. This work provides a general strategy for designing atomically dispersed noble-metal catalysts with highly dense active sites.

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