

# Experiment Brief

## OneView IS Camera

### Title

Capturing nanoparticle transformation dynamics

### Gatan Instrument Used

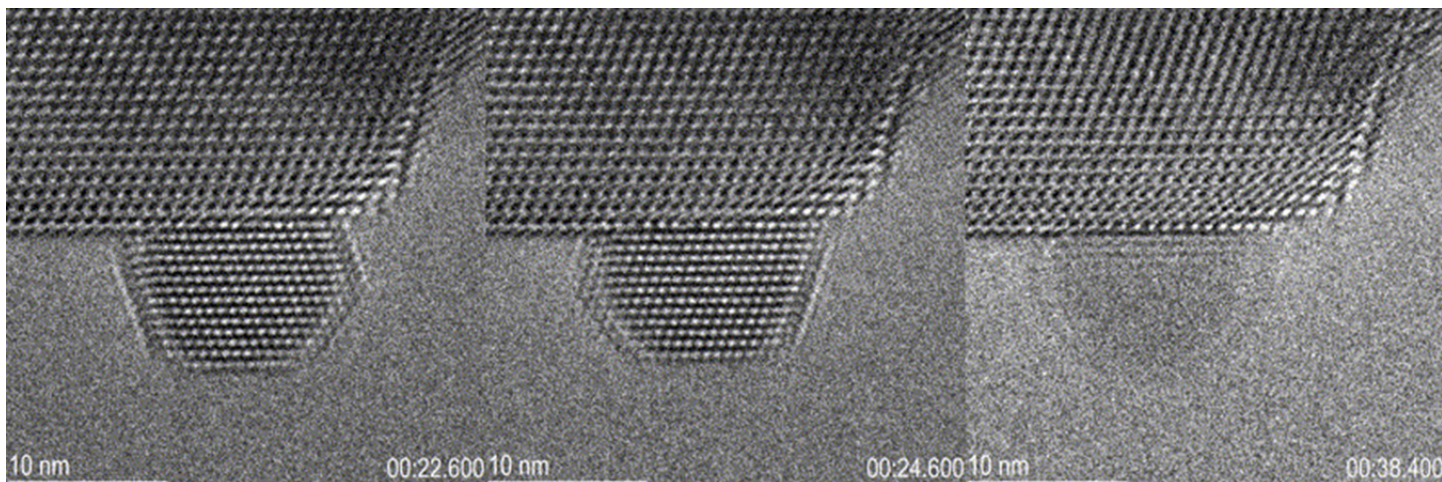
The OneView<sup>®</sup> IS camera is the fastest and highest performance fiber-coupled Gatan camera, displaying and saving 16 MP images to disk at up to 25 fps to **observe dynamic details during *in-situ* transmission electron microscope (TEM) experiments.**

### Background

The interface between metal catalyst nanoparticles and reducible oxide supports is crucial to their catalytic functionality. This interface can promote specific orientations of the nanoparticles, as well as reduce particle coalescence and sintering. However, actual atomic-scale imaging of supported nanoparticles in an operational environment has been challenging and rare. Here direct imaging of the nanoparticle structure is performed over time to enable a detailed analysis of both the structure and dynamics during heating in oxygen.

### Materials and Methods

The CeO<sub>2</sub> supported Au nanoparticles were prepared on DENSsolutions Wildfire heating chip, and observed using an image-corrected FEI Titan ETEM at 300 kV. The sample was heated to 700 °C in 4.5 Pa O<sub>2</sub>. Data was continuously recorded using a OneView IS camera at 5 fps, for a total of 318 frames, as detailed in: Liu, P. et al. *Nanoscale* 11, 11885–11891 (2019). <https://doi.org/10.1039/C9NR02731A> and Liu, P. et al. *J. Phys. Mater.* 3, 024009 (2020). <https://doi.org/10.1088/2515-7639/ab82b4>



**Figure 1.** Three frames from a continuously recorded video showing two crystalline orientations and a non-crystalline phase. The nanoparticle is non-crystalline about 32% of the ~1-minute video plus switches from between crystalline and non-crystalline states 16 times. The full video can be watched here: <https://www.rsc.org/suppdata/c9/nr/c9nr02731a/c9nr02731a1.gif>

### Summary

The video of this Au nanoparticle shows frequent melting and recrystallization, along with two well-defined relationships between the support and the crystalline Au lattice. This illustrates the dynamic nature of this catalyst close to the melting temperature, as well as the significant impact of the support in determining the nanoparticle orientation.

### Credit(s)

A special thanks to the Technical University of Denmark, including Pei Liu, Tiantian Wu, Jacob Madsen, Jakob Schiøtz, Jakob Birkedal Wagner, and Thomas Willum Hansen

**Gatan, Inc.** is the world's leading manufacturer of instrumentation and software used to enhance and extend electron microscopes—from specimen preparation and manipulation to imaging and analysis.

