**Experiment Brief**

**K2 IS Camera**

**Title**
Dynamic tomography of InAs V-shaped membranes while *in-situ* heating in a TEM

**Gatan instrument used**
Gatan K2® IS camera is the fastest and highest performance *in-situ* camera to resolve dynamic details in heating, catalysis, mechanical deformation, STEM diffraction, electrical testing, and chemical reaction experiments.

**Background**
3D imaging that is both dynamic and time-resolved (x, y, z, and time) has been implemented for many years in different scientific fields for studying flows, plasma, deformations and combustion. Conventionally, a full tomographic tilt series in a transmission electron microscope (TEM) can take 10 – 60 min to compile. Simply put, in a TEM, creating a tilt series is the same as using stop animation; it is extremely time consuming, while potentially missing the subtleties you may require during your experiment. This time requirement has been the main obstacle of achieving reasonable temporal resolution, along with geometrical constraints and poor detection efficiencies.

Recently, rapid tomographic acquisition was demonstrated while continuously rotating the specimen inside a TEM. This continuous specimen rotation results in the acquisition of a full tilt series in only 3 – 5 s. But in order to collect images with a high tilt angle resolution and apply this technique to dynamic electron tomography experiments, a fast camera is needed to capture high quality images with sub-second resolution.

**Materials and Methods**
Here we took advantage of the fast speed (400 fps) and high detection quantum efficiency (DQE) of the K2 IS camera to collect the first ever dynamic tomography experiment inside a TEM. Morphological changes were recorded as the specimen (InAs V-shaped nano-membrane) was continuously tilted between -65 and +60°, and the temperature was changed from room temperature up to 420 °C then back at the highest tilt angle.

**Summary**
It is possible to create a fully dynamic tomographic tilt series while achieving sub-second temporal resolution. Because of the high speed of K2 IS camera, more number of images were captured in a short amount of time, with high tilt angle and temporal resolution, which along with the high quality images (result of the K2 IS high DQE), make 4D reconstruction of this dataset possible.

**Credit(s)**
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