

Supporting information

Size-dependent amorphous-crystalline phase transitions in ultra-small gold colloids

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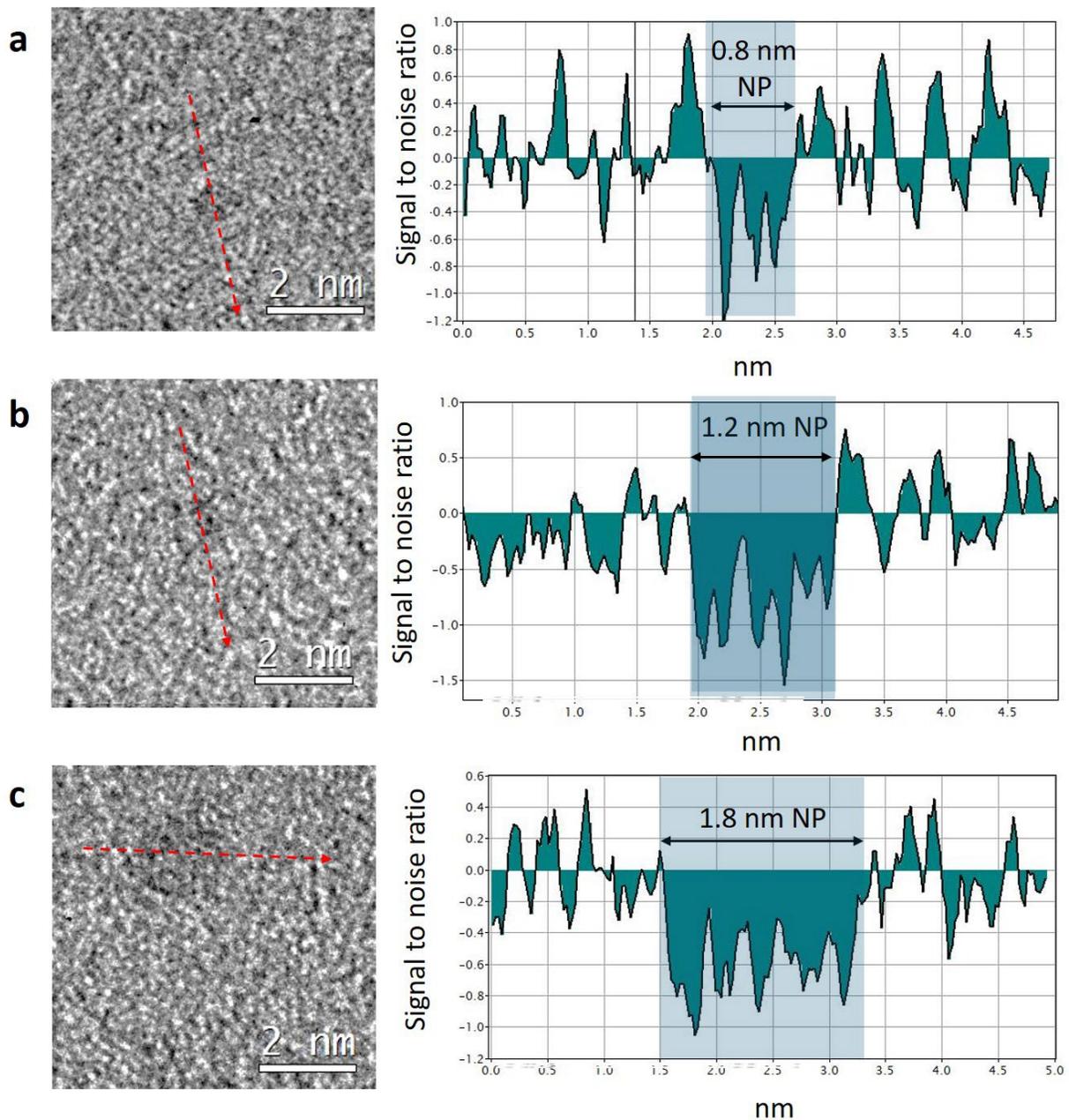


Figure S1: Detection and size measurements of amorphous gold NPs. HRTEM image (left) and signal to noise ratio profile (right) measured along the red arrow shown on the image. We can see that mass–thickness and phase contrasts result in a significant reduction of signal level in the NP area, with mean and minimal values of the signal-to-noise ratio of -0.6 and up to -1.6, respectively, instead of 0 and up to -0.6 in the area without NP. Given the sharp intensity transition observed at the edges of NPs (along 0.1 nm on average) the precision of the size measurements can be considered to be ± 0.2 nm.

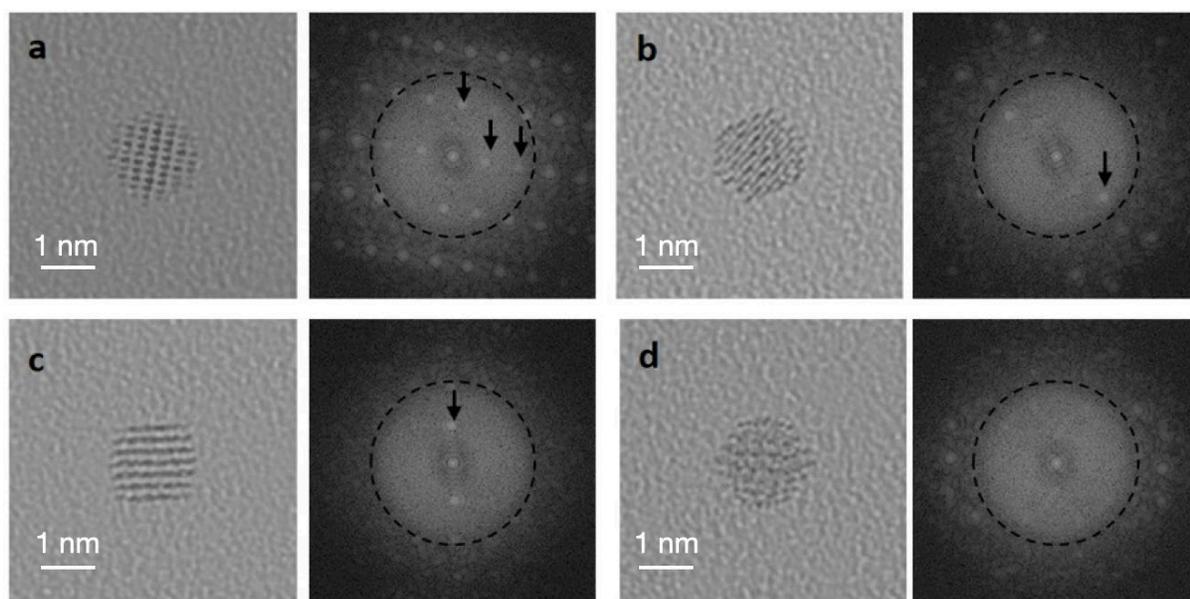


Figure S2. Multi-slice HRTEM image simulations of a 1.5 nm cuboctahedral gold nanoparticle randomly oriented over an amorphous carbon film of 3 nm in thickness. These images were calculated by using the same optical parameters than the experimental images (see method section). The corresponding FFT of the simulated HRTEM image is displayed on its right. When detected, the characteristic Bragg peaks of the gold FCC structure are indicated with black arrows. The dashed circle indicates the 10 nm^{-1} spatial frequency. A total of 1000 images were simulated by randomly changing the orientation of the nanoparticle. **(a-c)** Examples where the structure of gold is clearly identified by the presence of Bragg peaks on the FFT. Such a crystal structure detection was possible on 96% of the 1,000 images. **(d)** Examples where the structure of gold cannot be identified because of the absence of a Bragg peak on the FFT below 10 nm^{-1} spatial frequency (corresponding to 0.1 nm resolution). Such conditions, where the orientation of the nanoparticle make it appears amorphous were observed on 4% of the 1,000 images.

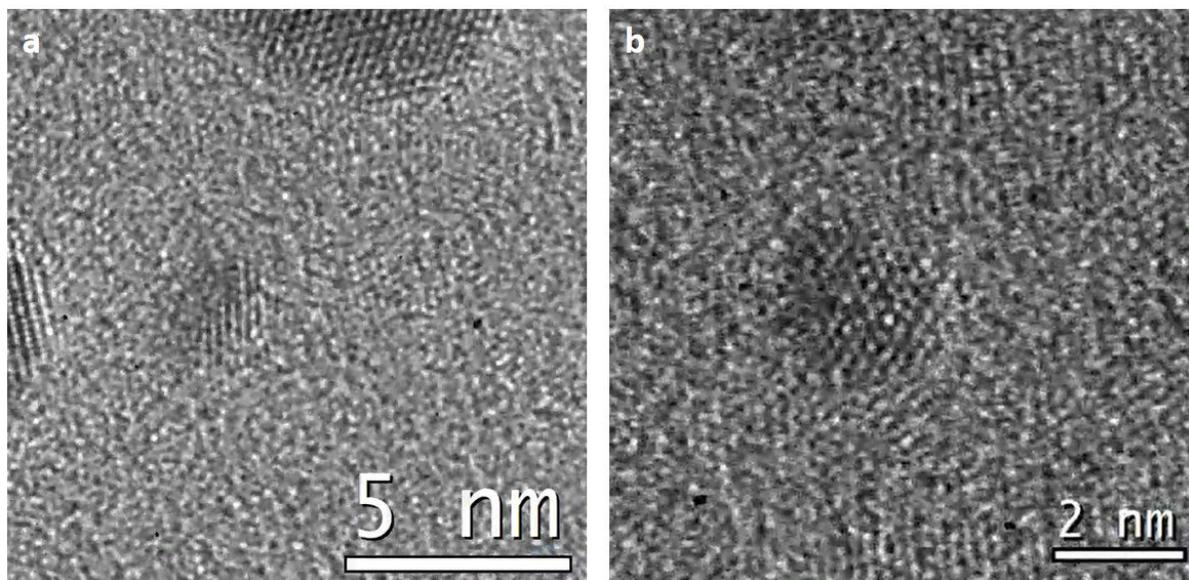


Figure S3. TEM images extracted from the videos **(a)** V3 and **(b)** V2, showing gold nanoparticles during their amorphous-crystalline phase transition. Both amorphous and crystalline areas are simultaneously seen in the nanostructure. Many other examples of such intermediated states can be seen by watching the video V4 and V4 in slow motion.

Parameter	value
Aberrations:	
Defocus (C1)	0.00 nm
Twofold astigmatism (A1)	0.95 nm
Coma (3-B2)	11.90 nm
Threefold astigmatism (A2)	31.4 nm
Spherical aberration (C3)	1.3 nm
Star aberration (4-S3)	961.2 nm
Fourfold astigmatism (A3)	964.7 nm
Fivefold astigmatism (A4)	19.8 nm
Other microscope parameters:	
High voltage	200 kV
Focal spread	3.5 nm
Beam semi-angle of convergence	0.5 mrad

Table S1: Simulation parameters for calculating HRTEM images in figure S1.

References

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