ADVANCED MATERIALS INTERFACES

Supporting Information

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Nanoscale Porosity of High Surface Area Gadolinium Oxide Nanofoam Obtained With Combustion Synthesis

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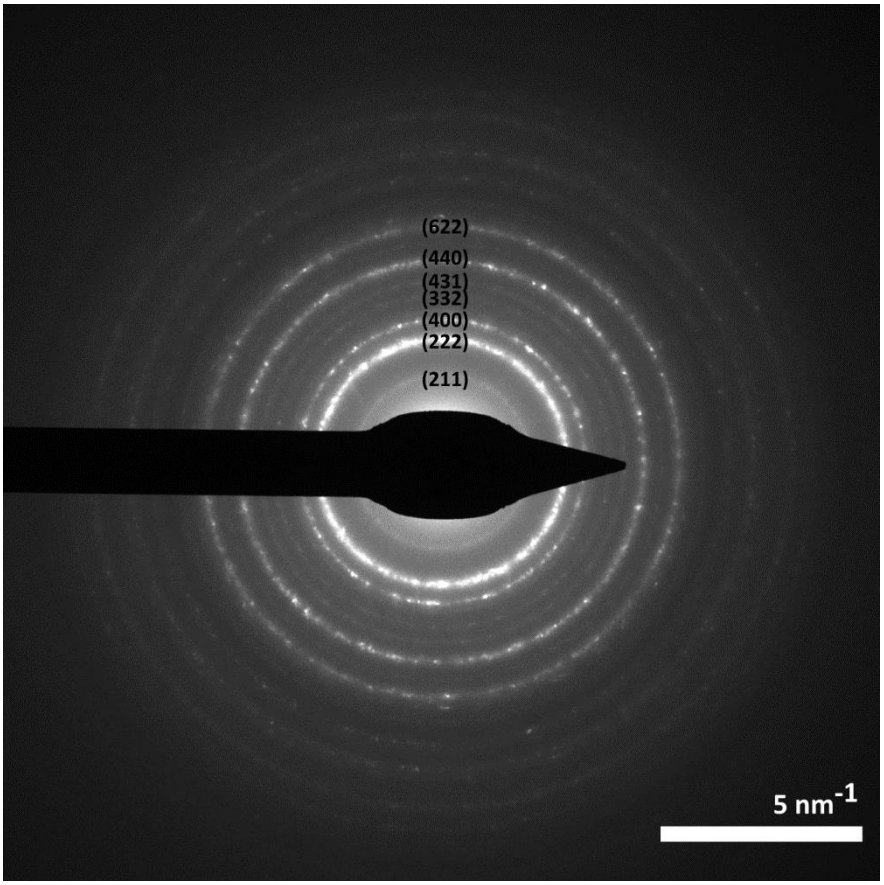

Figure S1: Indexed electron diffraction pattern indicating the cubic Gd_2O_3 phase.

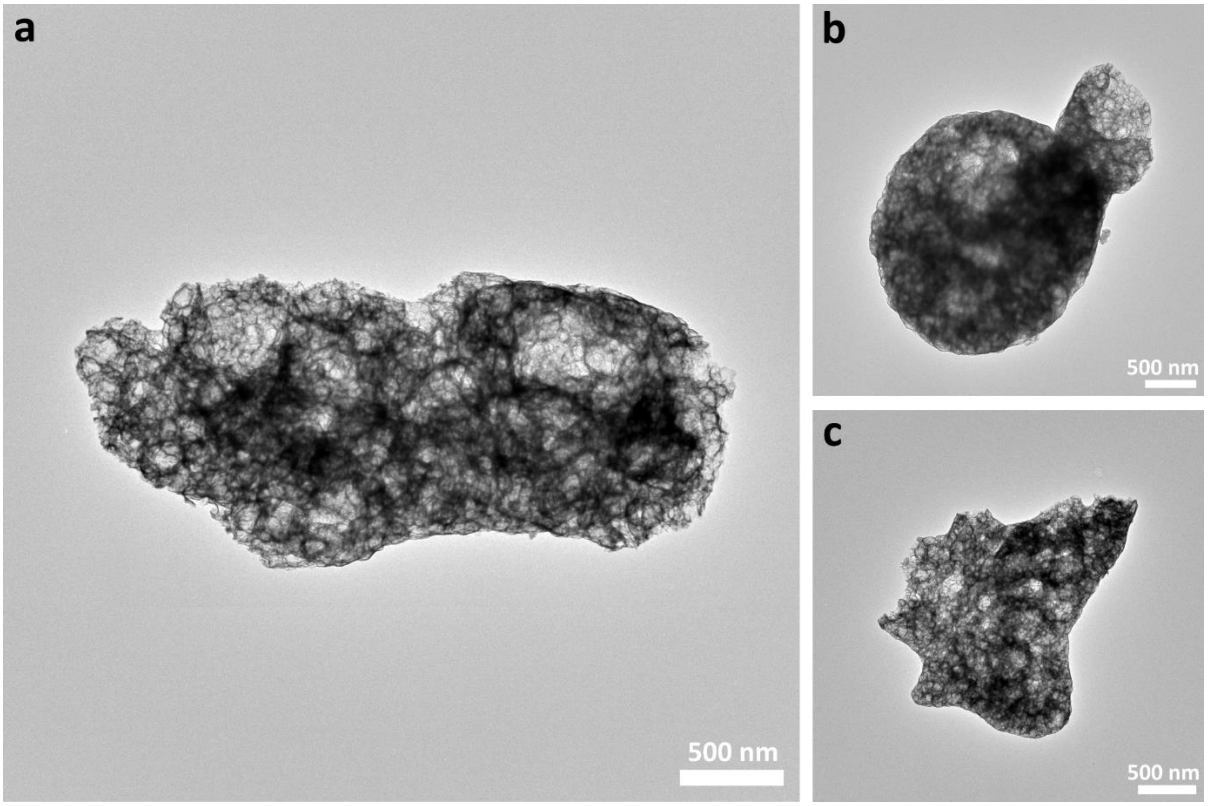

Figure S2: TEM images of different Gd_2O_3 morphologies showing a cylindrical (a), spherical (b), and irregular structure (c).

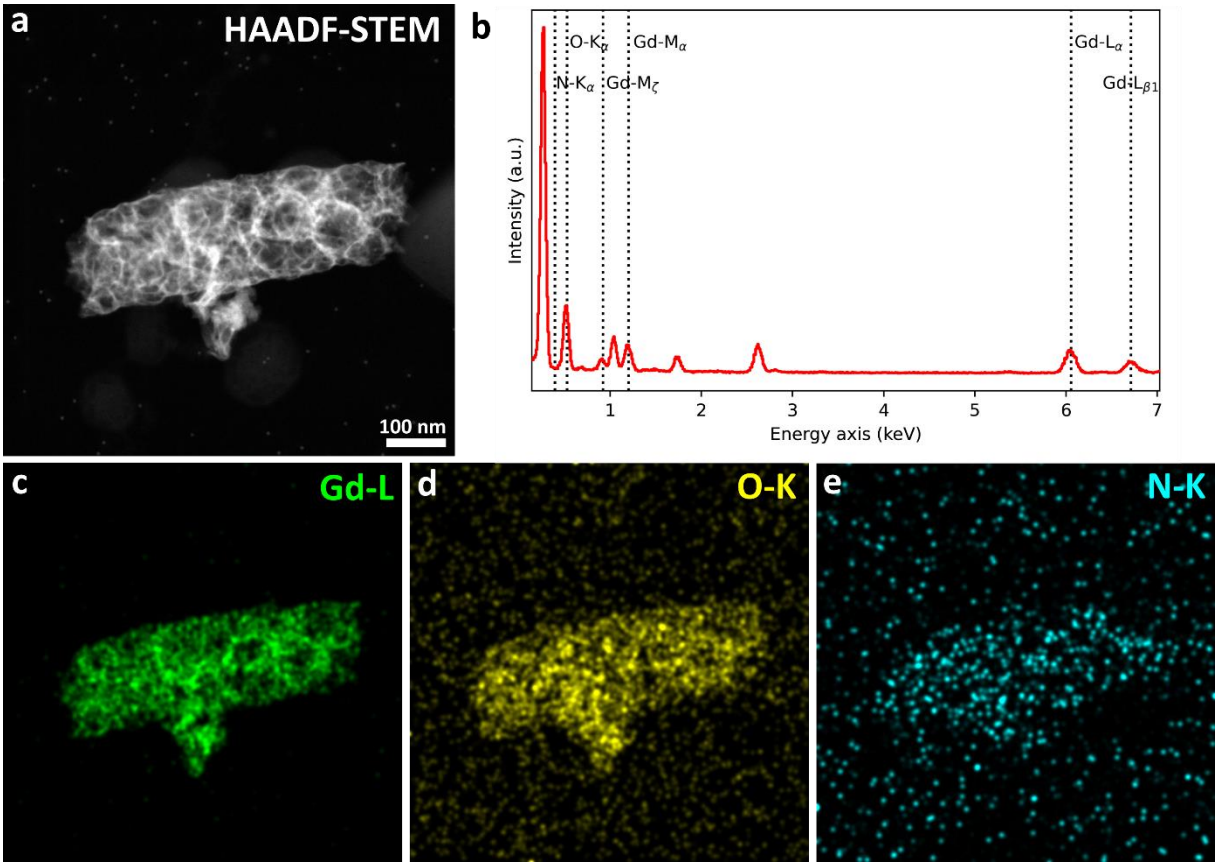

Figure S3: EDS analysis of the Gd_2O_3 grain shown in the HAADF-STEM image (a). The EDS spectrum in (b) shows peaks corresponding to the elements Gd and O, and the absence of a N peak. Elemental maps shown in (c) and (d) indicate that Gd and O are uniformly presented throughout the sample, whereas (e) shows that the presence of N is negligible.

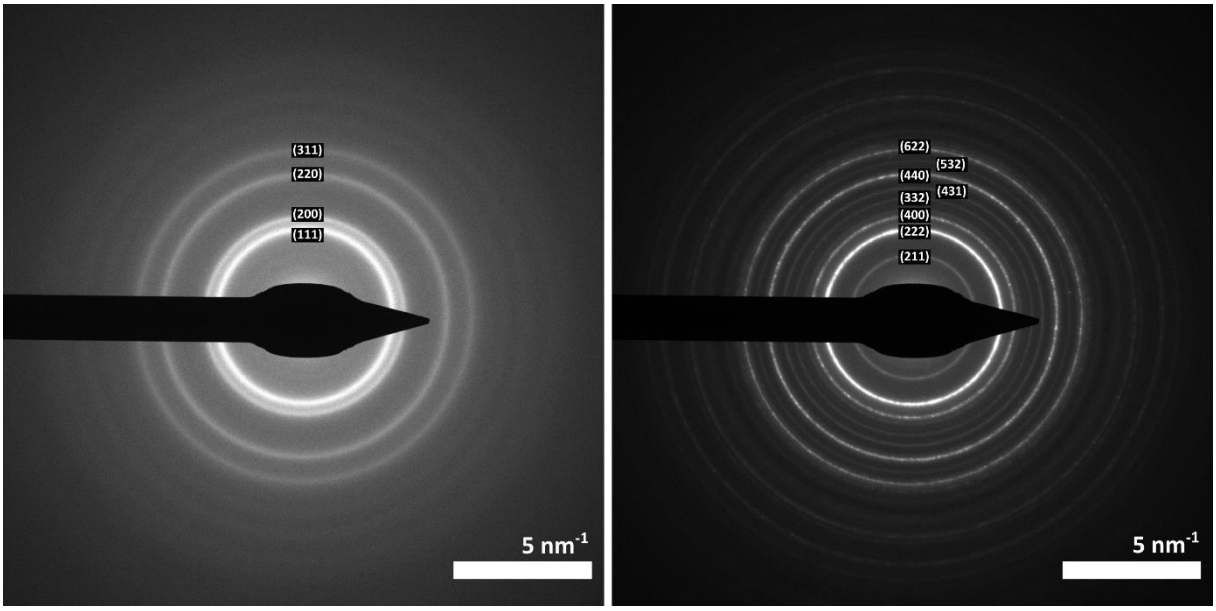

Figure S4: Indexed diffraction patterns of the in-situ heating to 600 ^{o}C corresponding to GdO (left) and the ex-situ heating to 900 ^{o}C corresponding to Gd_2O_3 (right).

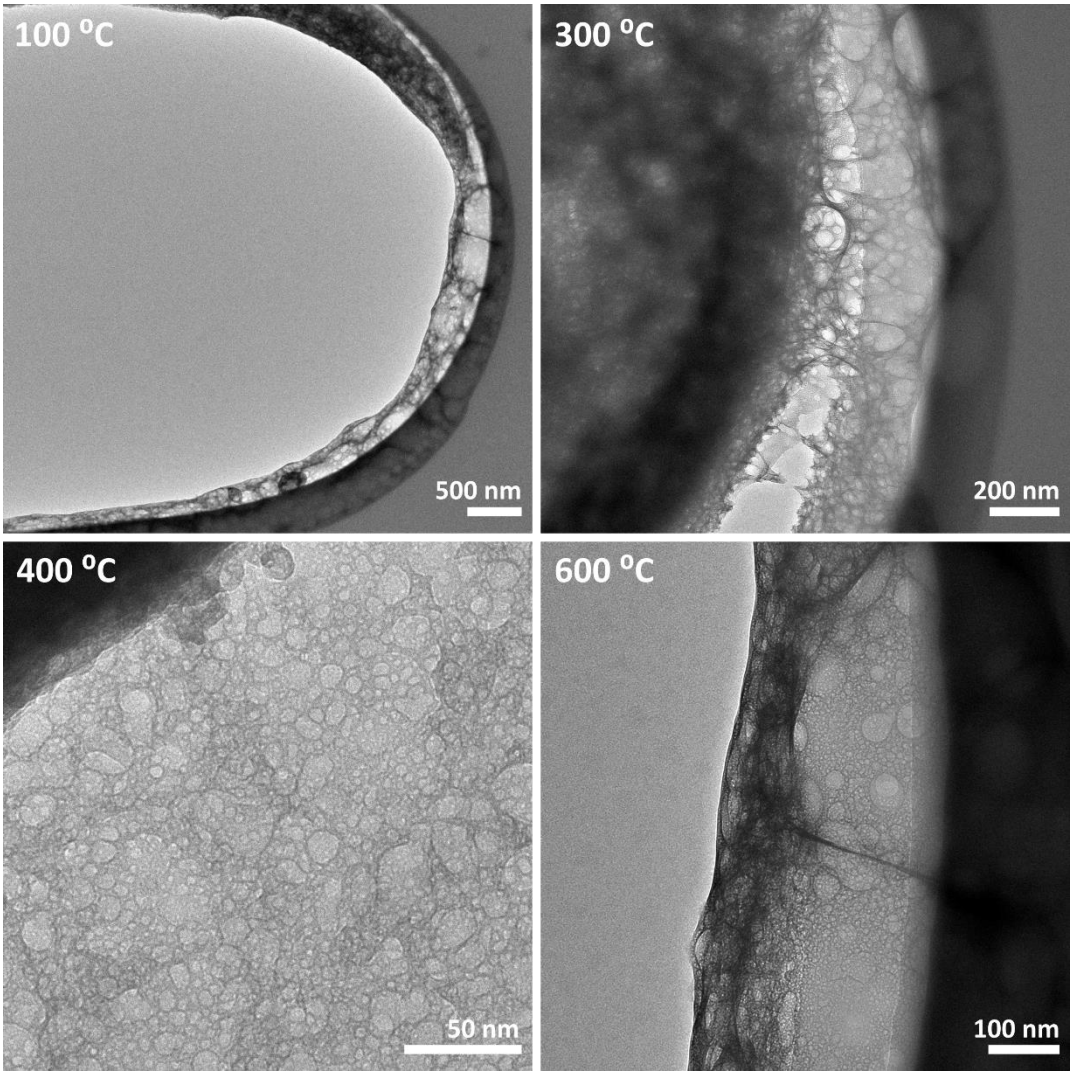

Figure S5: TEM images of Gd gel during in-situ heating to 600 °C.

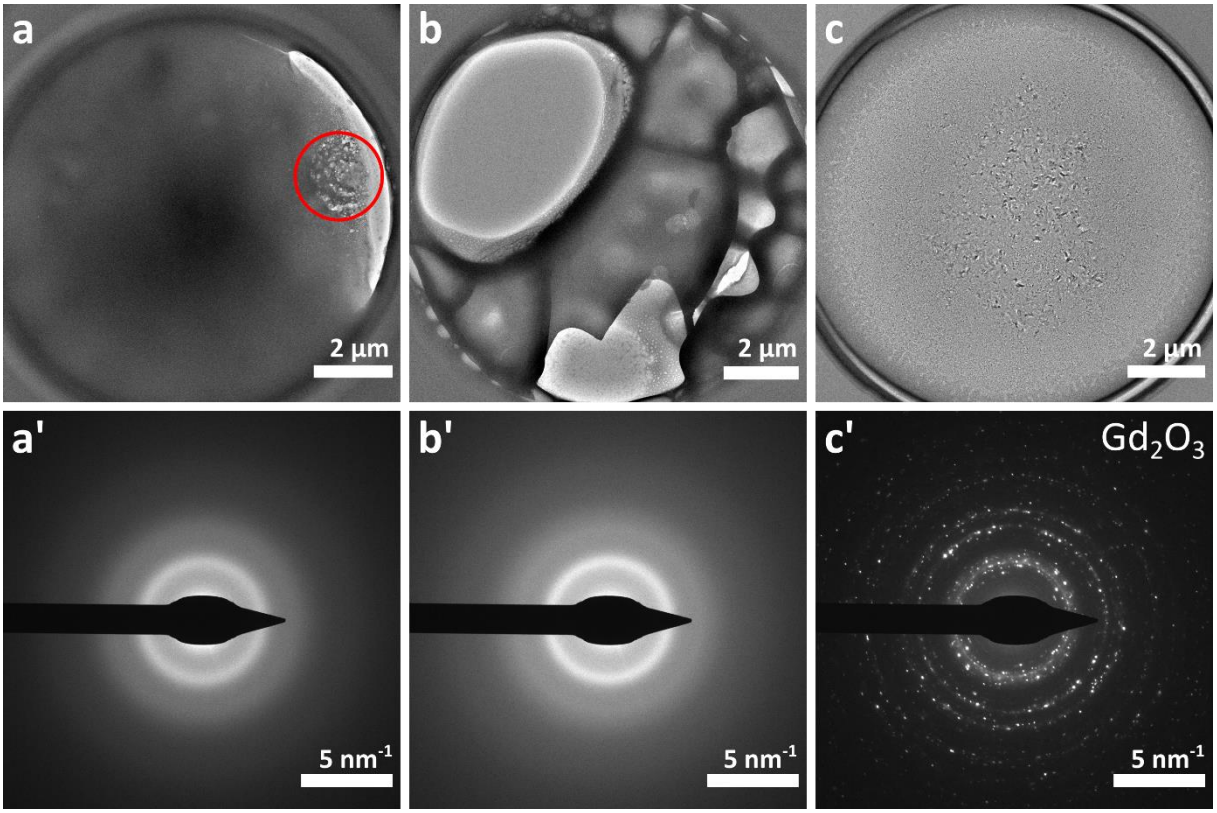

Figure S6: TEM window overview image of 600 ^{o}C in-situ sample after 6 weeks (a), 600 ^{o}C ex-situ sample after 6 weeks (b), and 900 ^{o}C ex-situ sample after 7 weeks (c) with corresponding diffraction patterns (‘). The red circle indicates the area that abruptly changed when illuminated with the electron beam.

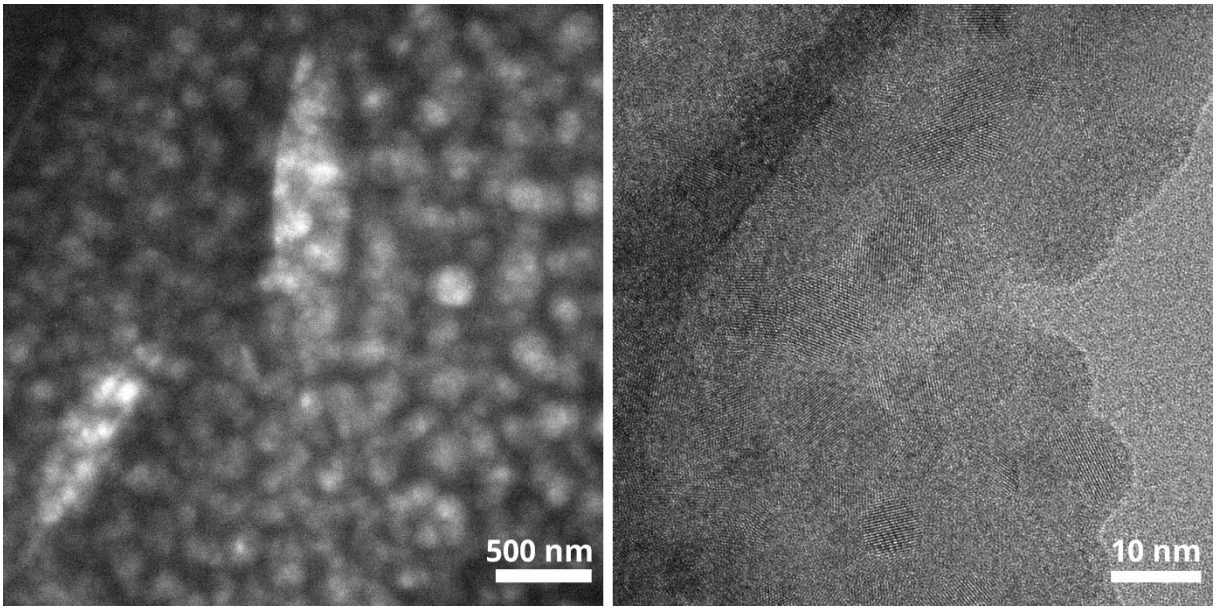

Figure S7: TEM image of the precursor heated to 100 ^{o}C showing large scale porosity (left) and HRTEM image of the precursor heated to 900 ^{o}C, which is not showing small scale porosity (right).

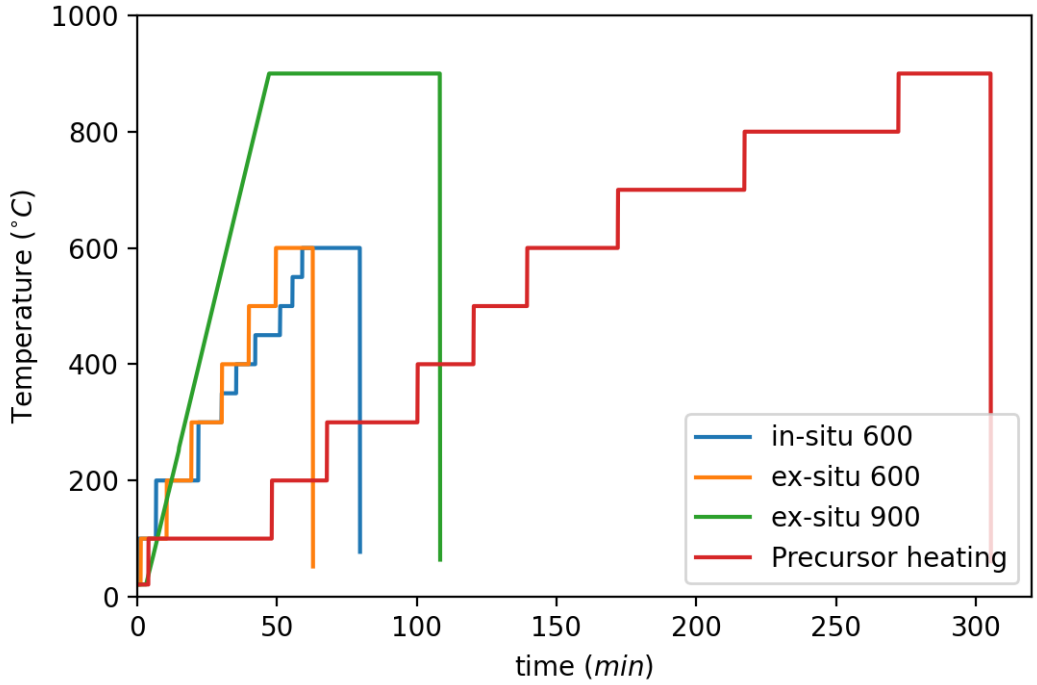

Figure S8: Heating profiles for the various in-situ and ex-situ experiments.

Supporting Video 1: Aligned tilt series of a large Gd_2O_3 piece tilted from -73^o to 80^o in TEM mode.

Supporting Video 2: Aligned tilt series of a large Gd_2O_3 piece tilted from -73^o to 80^o in STEM mode.

Supporting Video 3: Tomographic reconstruction of the large Gd_2O_3 piece acquired in STEM mode made using the weighted back projection algorithm.

Supporting Video 4: Animation of the 3D reconstruction of the large Gd_2O_3 piece, first showing the surface of the particle and then slicing through it.

Supporting Video 5: Aligned tilt series of a small Gd2O3 piece tilted from -65^o to 78^o in STEM mode.

Supporting Video 6: Tomographic reconstruction of the small Gd_2O_3 piece acquired in STEM mode made using the weighted back projection algorithm.

Supporting Video 7: Animation of the 3D reconstruction of the small Gd_2O_3 piece, first showing the surface of the particle and then slicing through it.