

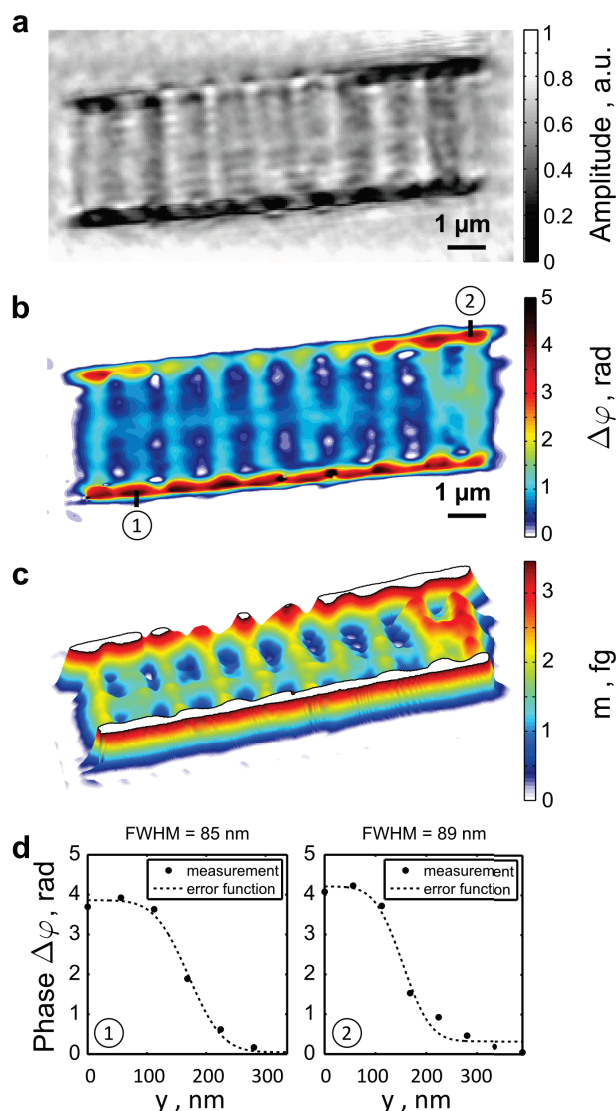
**MS42-O3** Water window ptychographic imaging with characterized coherent X-rays

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We report on a ptychographical coherent diffractive imaging experiment in the water window with focused soft X-rays at 500 eV. A X-ray beam with high degree of coherence was selected for ptychography at the P04 beamline of the PETRA III synchrotron radiation source. We measured the beam coherence with the newly developed nonredundant array method and determined a coherence length of 4.1  $\mu\text{m}$  and a global degree of coherence of 35% at 100  $\mu\text{m}$  exit slit opening in vertical direction. A pinhole, 2.6  $\mu\text{m}$  in size, selected the coherent part of the beam that was used to obtain ptychographic reconstruction results of a lithographically manufactured test sample and a fossil diatom. The achieved resolution was 53 nm for the test sample and only limited by the size of the detector. The diatom was imaged at a resolution better than 90 nm.



**Figure 1.** Ptychographic reconstruction of the amplitude (a) and the phase (b) of the fossil diatom. (c) Integrated  $\text{SiO}_2$  mass along the depth of the diatom and (d) FWHM values of two error function fits along the black lines indicated in the phase reconstruction in (b).

**Keywords:** ptychography, water window, non-redundant array, soft x-ray, diatom, coherent diffractive imaging, coherence