Supplementary Materials: Strain depth profiles in thin films extracted from in-plane X-ray diffraction

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A. Peak fit

In this section an example of peak fitting is shown. The fit used to derive the peak position in the analysis was a Gaussian function. The example in Fig. S1 displays the fit on the Cu(220) peak of a 300 nm film measured in the IP-GID geometry at α= 0.2°.

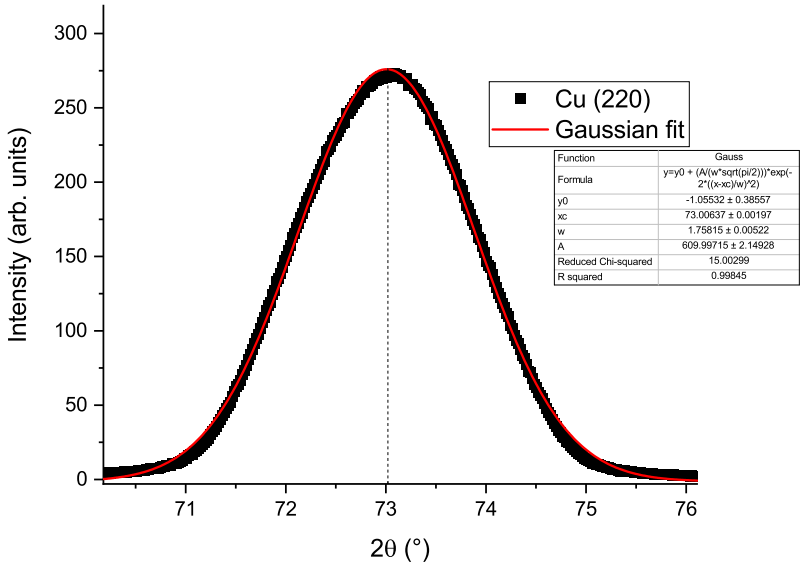

FIG. S1: (Color online) Gaussian fit on the Cu(220) reflection measured on the 300 nm thick film.

B. Fit results for 20, 150 and 300 nm Cu

In this section we present the fit results using the 4 different methods described in the main text applied to 20 (Fig. S2), 150 (Fig. S3) and 300 (Fig. S4) nm Cu thick films.

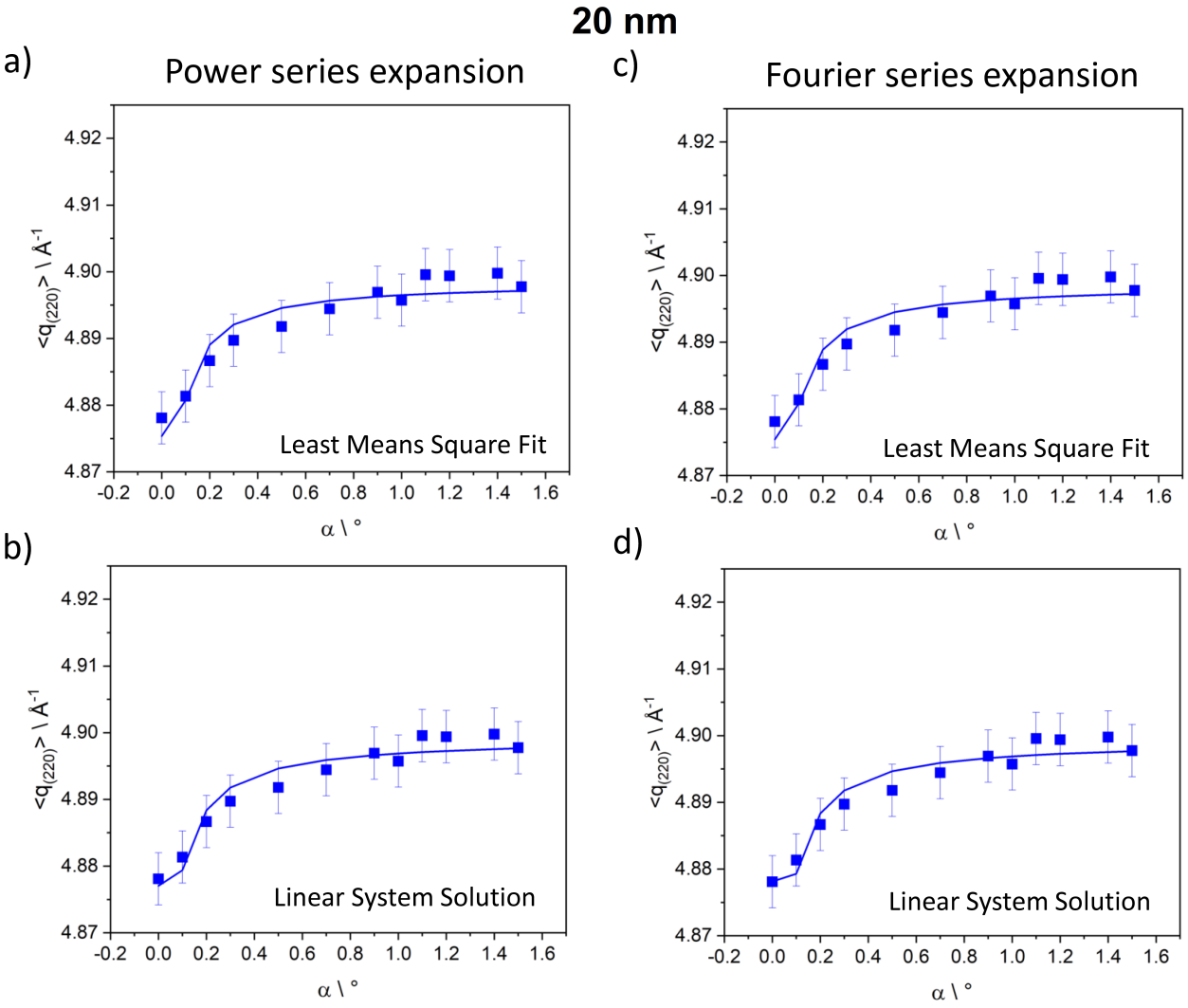

FIG. S2: (Color online) Cu 20 nm sample. Fit of the average peak position for the (220) Bragg reflexion as a function of the incident angle. Montecarlo least squares fit a) for power series expansion and c) for Fourier series expansion. Linear system solution b) for power series expansion and d) for Fourier series expansion.

All the obtained fits independently of the method, produced a similar strain profile for each thickness, reported in the main text.

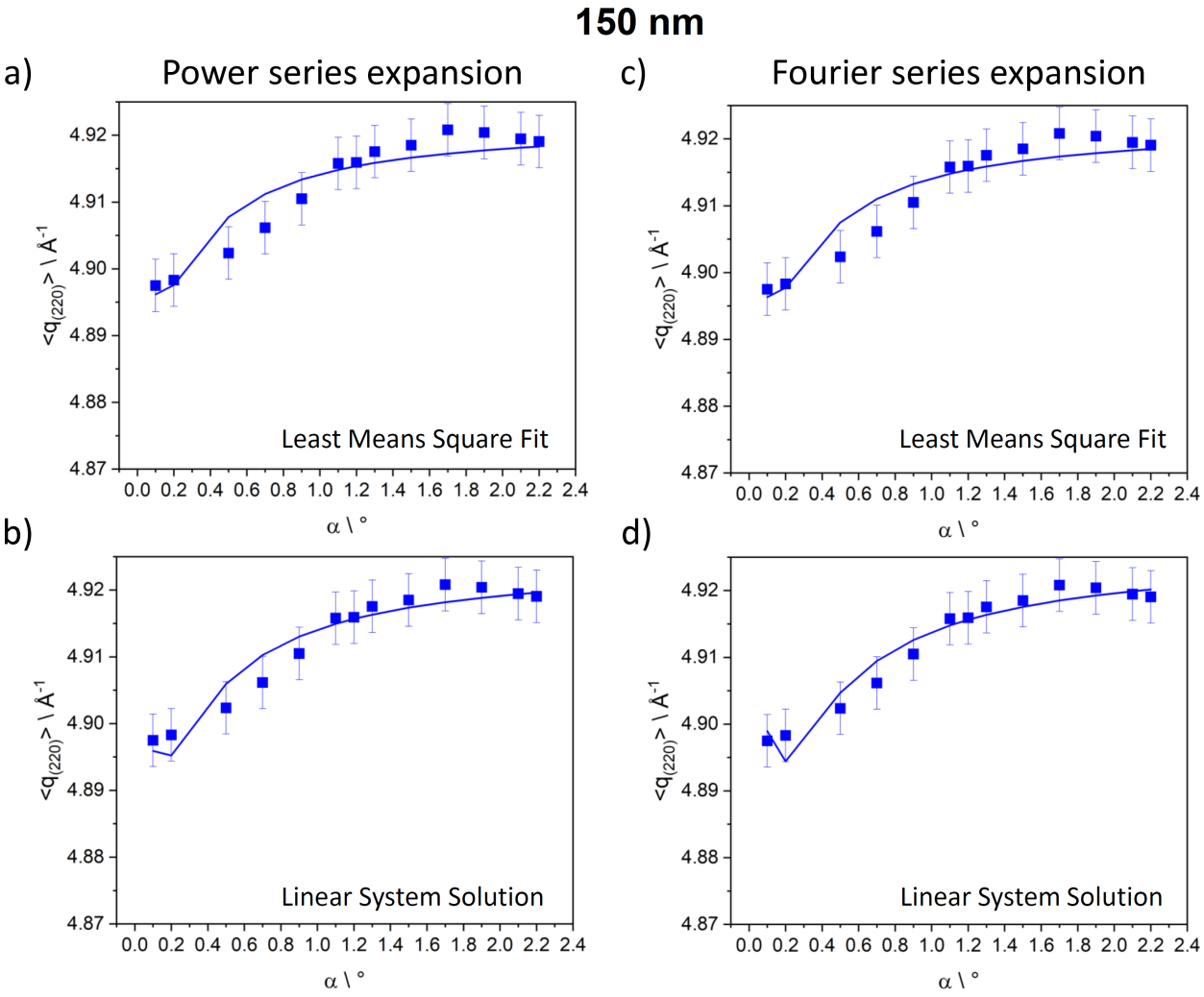

FIG. S3: (Color online) Cu 150 nm sample. Fit of the average peak position for the (220) Bragg reflexion as a function of the incident angle. Montecarlo least squares fit a) for power series expansion and c) for Fourier series expansion. Linear system solution b) for power series expansion and d) for Fourier series expansion.

C. Cu morphology

The surface morphology of metal and reduced Cu films was characterized by a high resolution Scanning electron microscope (SEM, Hitachi S-4800). The clear difference in morphology between the compact as deposited Cu thin film and the porous Cu reduced film is depicted in Fig.S5.

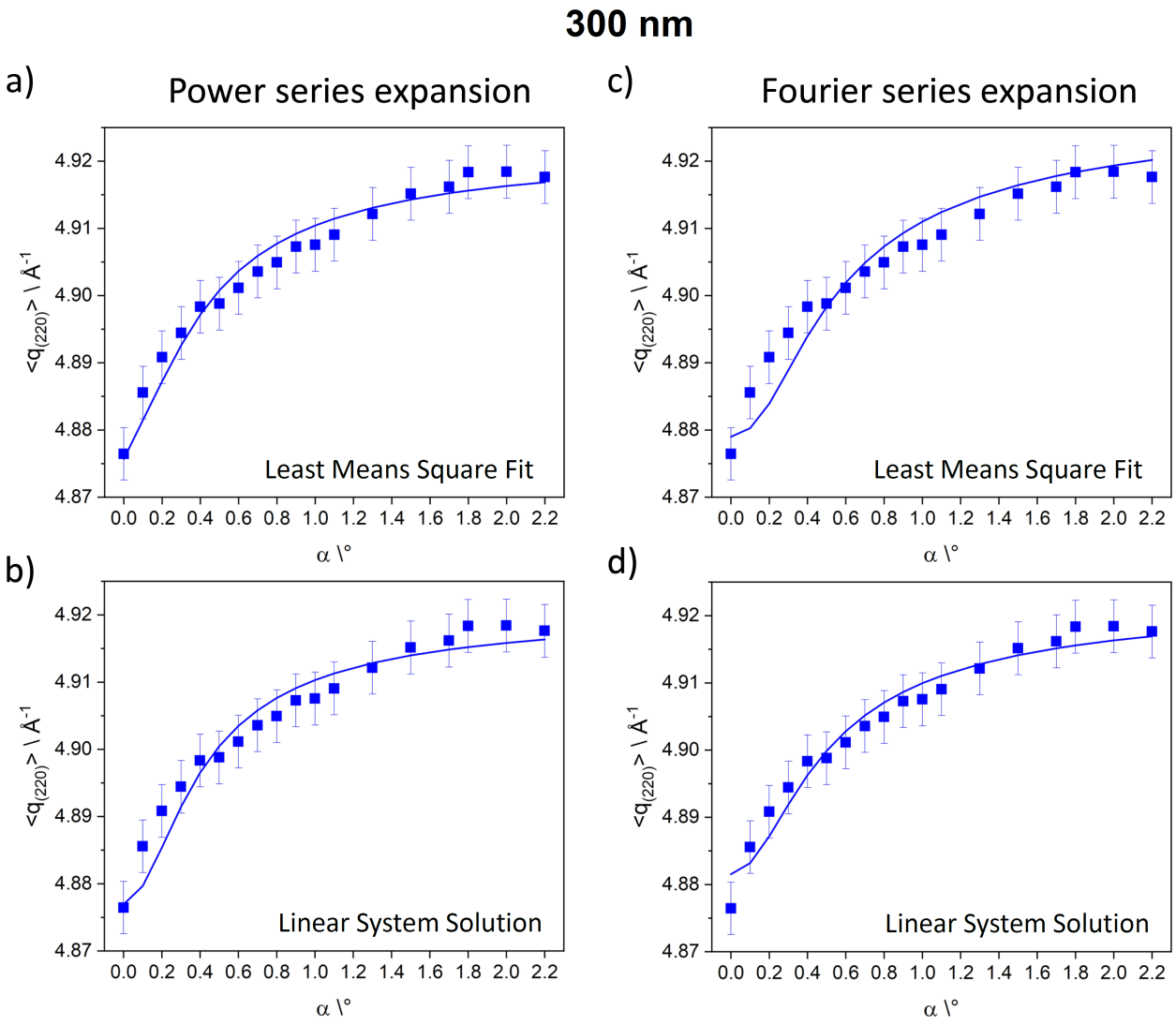

FIG. S4: (Color online) Cu 300 nm sample. Fit of the average peak position for the (220) Bragg reflexion as a function of the incident angle. Montecarlo least squares fit a) for power series expansion and c) for Fourier series expansion. Linear system solution b) for power series expansion and d) for Fourier series expansion.

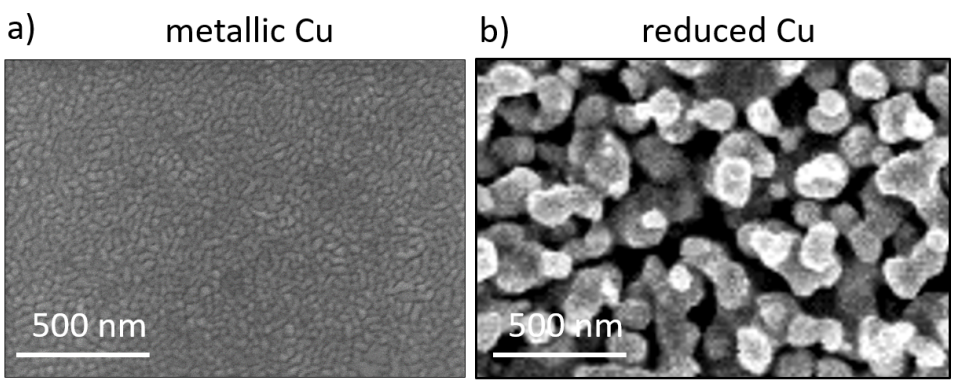

FIG. S5: (Color online) a) Typical Cu metallic thin film morphology and b) porous structure after oxidation and reduction process measured for a 300 nm Cu film.