## Detailed and Direct Observation of Sulfur Crystal Evolution During Operando Analysis of a Li-S Cell with Synchrotron Imaging

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The image post-processing was performed according to the steps in figure S1.



**Figure S1** Post-processing procedure for all X-ray radiography images. **A**: Raw image. **B**: Darkfield subtracted and flatfield corrected X-ray image. **C**: Underlying ramp-like attenuation due to inhomogeneous thickness of the monolithic electrode. **D**: X-ray image divided by the ramp-like attenuation of C. **E**: Removal of lateral stripes by fast Fourier transform (FFT). **F**: Moving Average for noise reduction.



**Figure S2** X-ray radiography images of sulfur crystals on the monolithic carbon electrode in the same electrochemical stage like figure 2F (3.0 V) which is the very left one for comparison reasons. The white arrows indicate the areas of crystal imperfections.



**Figure S3** X-ray radiography images of sulfur crystals on the monolithic carbon electrode during the first charge step. The highlighted region (white dashed line) is magnified in figure 2. The images A-F are recorded at the same time as the respective images A-F in figure 2.



**Figure S4** X-ray radiography images of sulfur crystals on the monolithic carbon electrode during the first discharge step. The highlighted region (white dashed line) is magnified in figure 3. The images A-F are recorded at the same time as the respective images A-F in figure 3.