

Description of Additional Supplementary Files

File Name: Supplementary Movie 1

Description: **Defect evolution during cycle 2.** Potential (E), current (I) and total scattered intensity (Int) curve during the time scan. The FFDXM images were taken at -0.03° off the Si (004) Bragg θ angle with a rate of 1 frame per second. Only area around the two early-stage defects is shown for simplicity.

File Name: Supplementary Movie 2

Description: **Defect evolution during cycle 3.** Potential (E), current (I) and total scattered intensity (Int) curve during the time scan. The FFDXM images were taken at -0.03° off the Si (004) Bragg θ angle with a rate of 1 frame per second. Only area around the two early-stage defects is shown for simplicity.

File Name: Supplementary Movie 3

Description: **Animation of SEI growth and early-stage defect formation.** Animated model which highlights the inhomogeneities of the dual-layer SEI and their impact on the formation of early-stage defects in the Si electrode.