Supporting Information

Effects of O_2 on Coupled Structural Transformation of Birnessite and Degradation of Humic Substances

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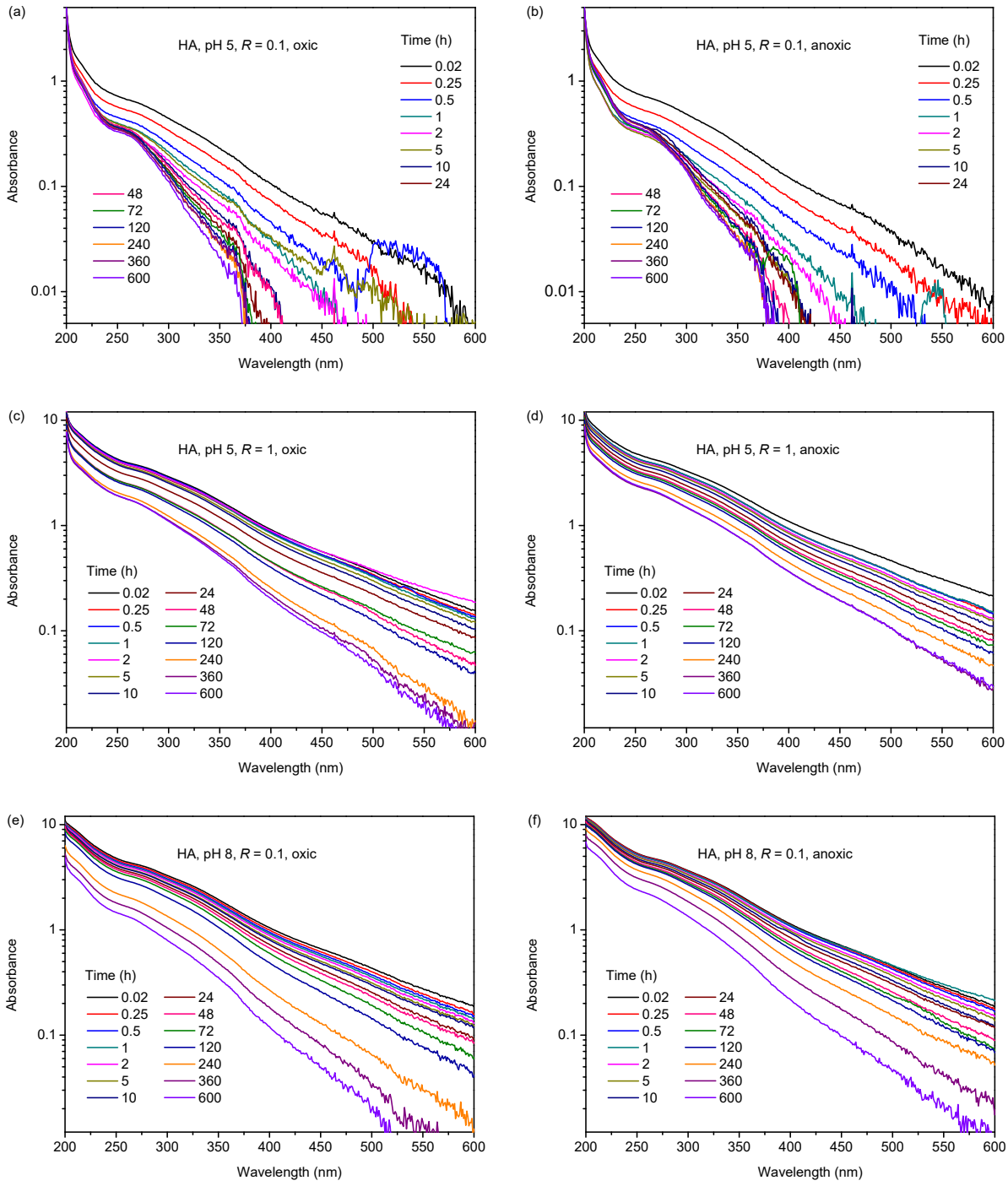


Fig. S1 UV-vis spectra of remaining (**a-h**) HA and (**i-l**) FA during reaction with δ-MnO_2 at pH 5 and 8 with R = 0.1 and 1 under oxic or anoxic conditions. Refer to each panel for corresponding condition (e.g., HA, pH 5, R = 0.1, oxic). The absorbance was plotted on a long scale for clarity.

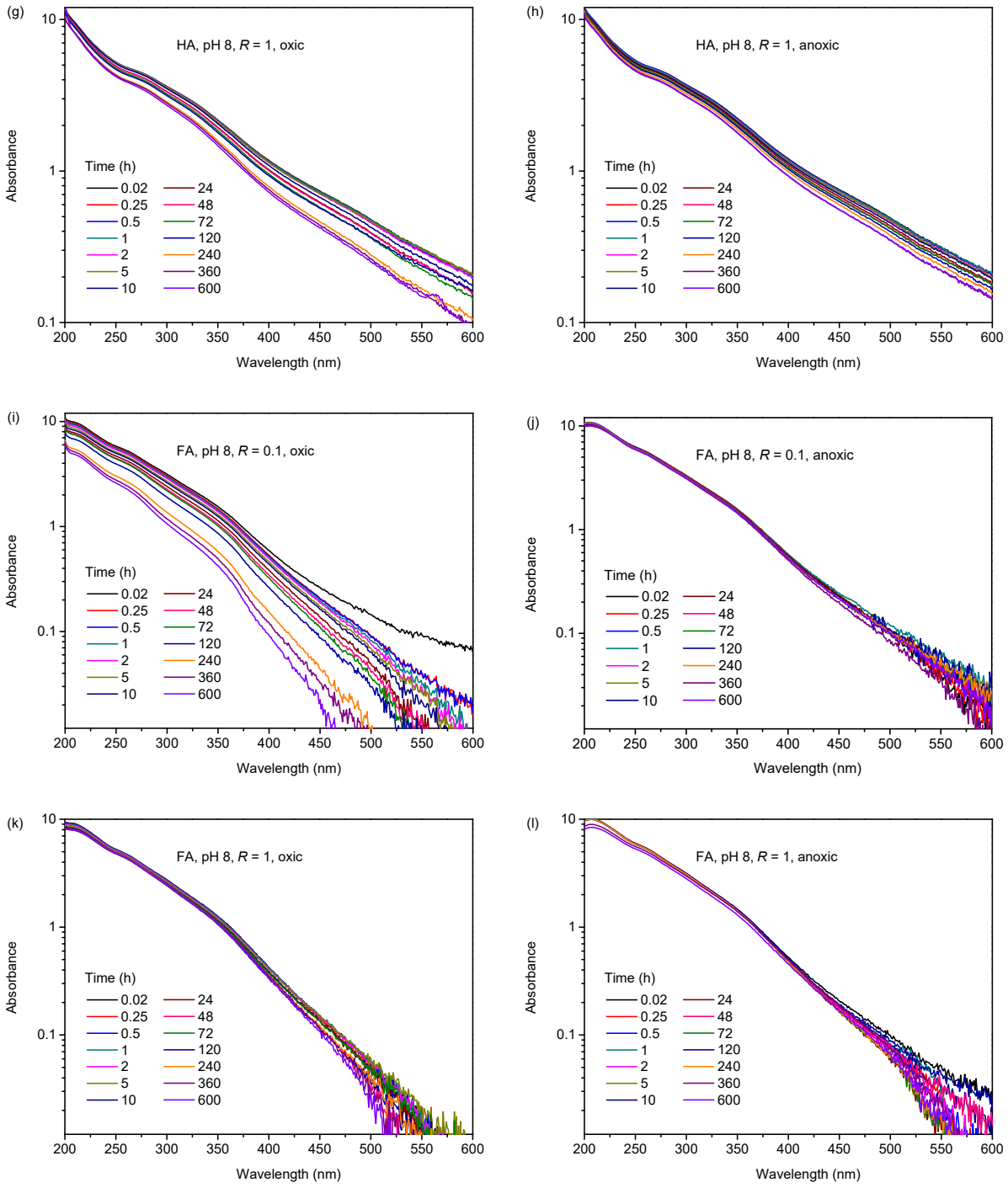


Fig. S1 (Continued) UV-vis spectra of remaining (**a-h**) HA and (**i-l**) FA during reaction with δ-MnO_2 at pH 5 and 8 with R = 0.1 and 1 under oxic or anoxic conditions. Refer to each panel for corresponding condition (e.g., HA, pH 5, R = 0.1, oxic). The absorbance was plotted on a long scale for clarity.

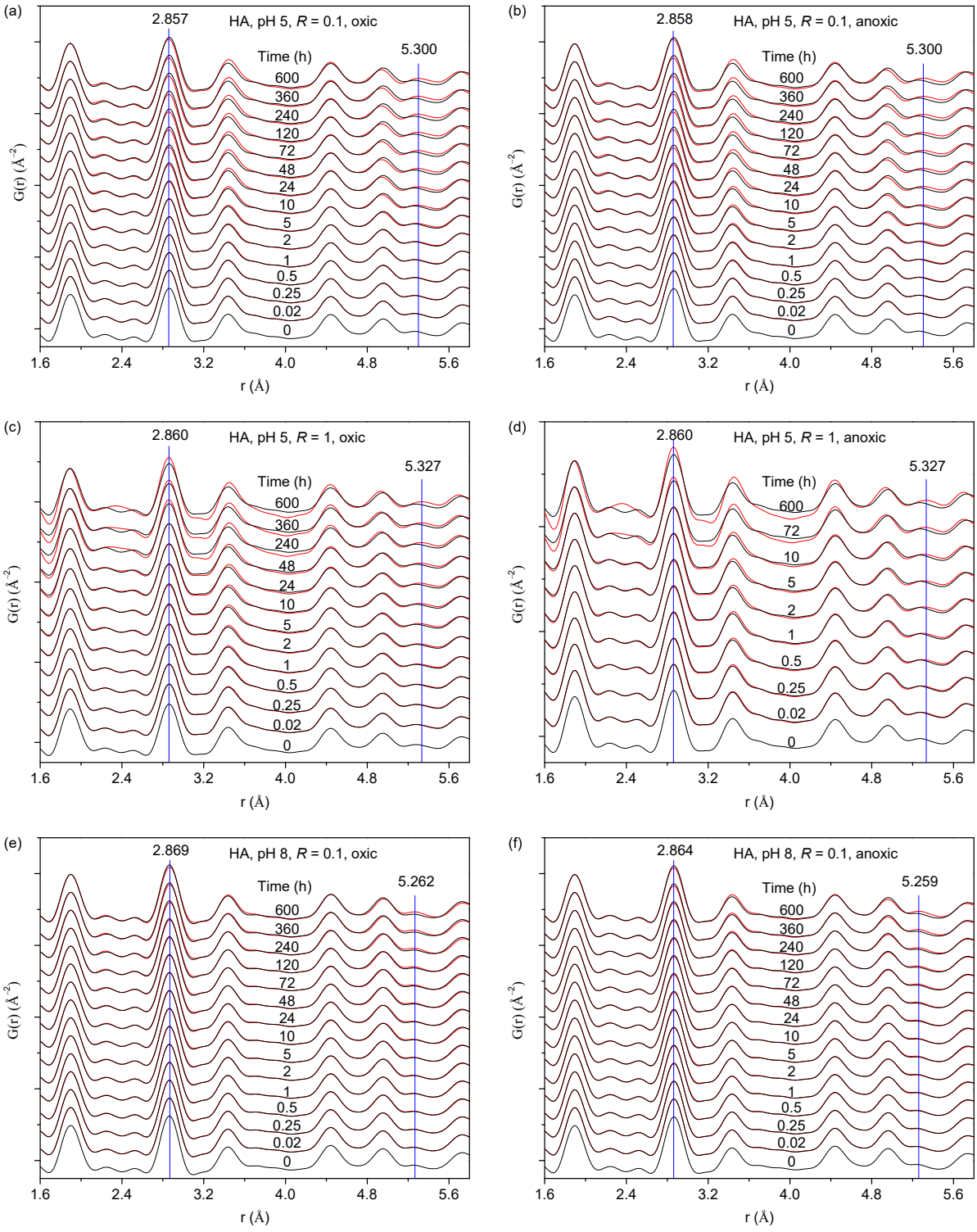


Fig. S2 X-ray PDF within 5.8 Å for δ-MnO_2 reacted with (**a**-**h**) HA and (**i**-**l**) FA at pH 5 and 8 with R = 0.1 and 1 under oxic or anoxic conditions. Refer to each panel for corresponding condition (e.g., HA, pH 5, R = 0.1, oxic). The highlighted peaks show clear shifts with increasing reaction time under each condition. The PDF pattern of starting point (black) overlaps those of the time series (red) for better comparison.

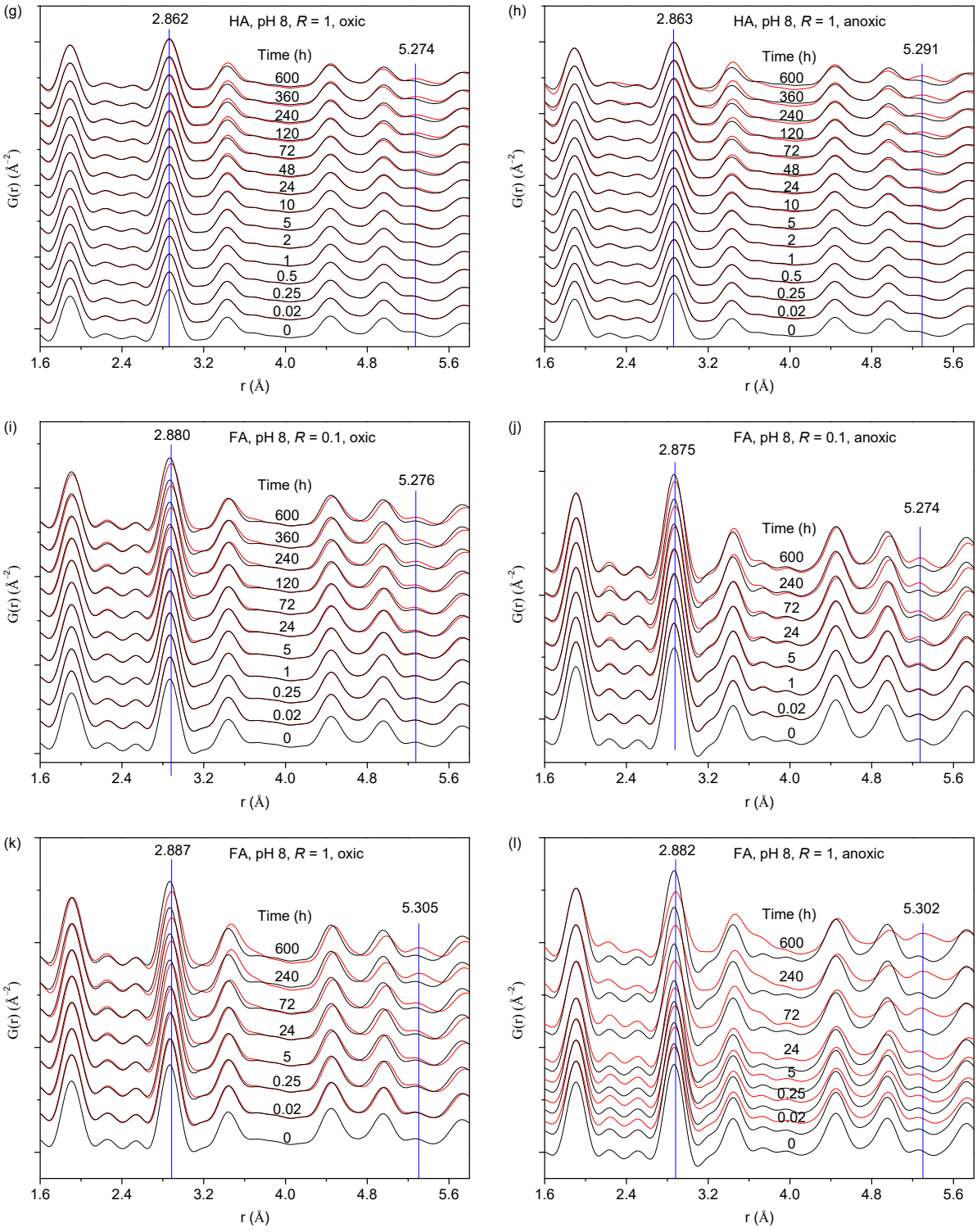


Fig. S2 (Continued). X-ray PDF within 5.8 Å for δ-MnO_2 reacted with (**a**-**h**) HA and (**i**-**l**) FA at pH 5 and 8 with R = 0.1 and 1 under oxic or anoxic conditions. Refer to each panel for corresponding condition (e.g., HA, pH 5, R = 0.1, oxic). The highlighted peaks show clear shifts with increasing reaction time under each condition. The PDF pattern of starting point (black) overlaps those of the time series (red) for better comparison.

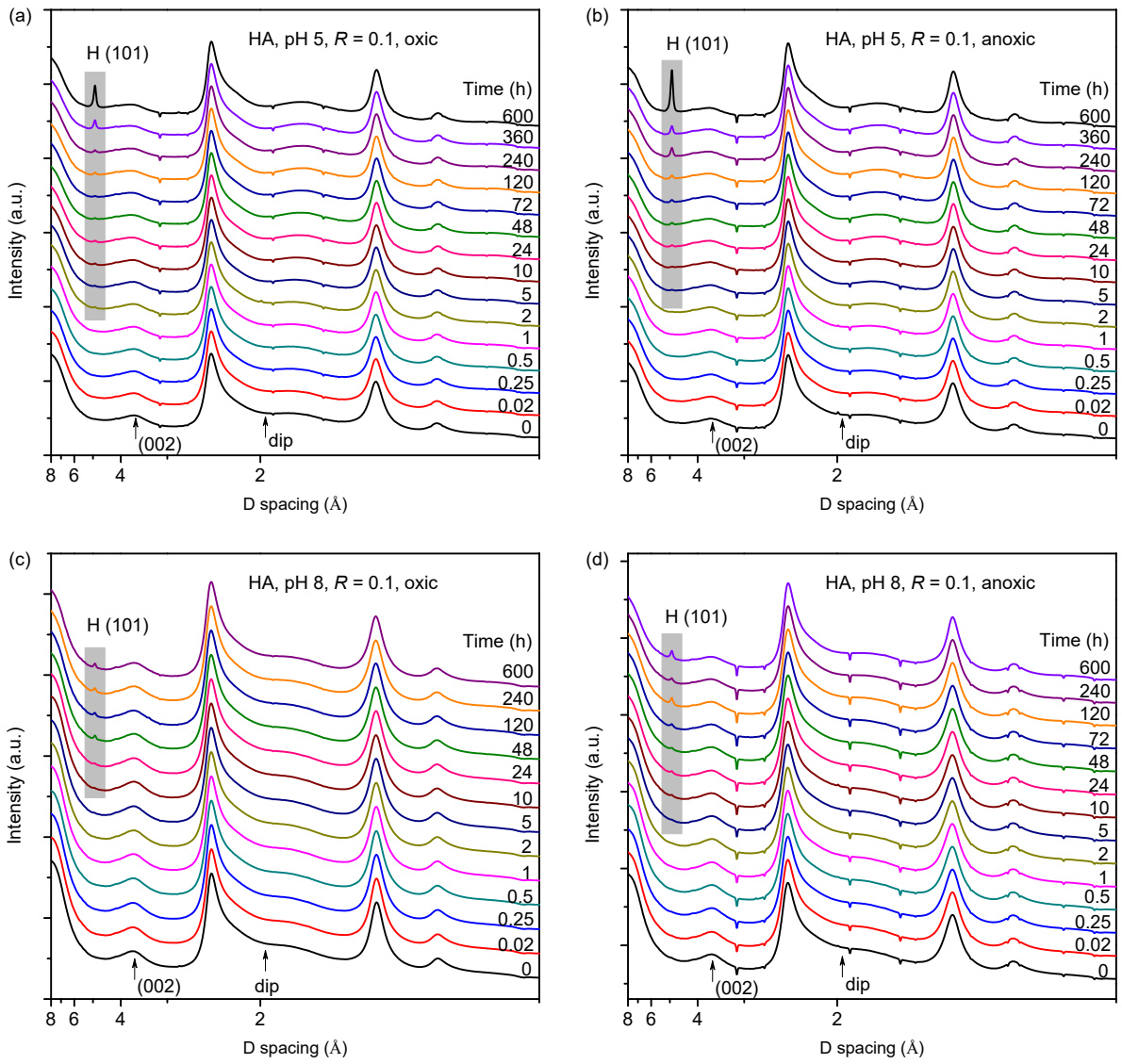


Fig. S3 Synchrotron-based X-ray diffraction patterns of δ-MnO_2 reacted with HA at (**a**), (**b**) pH 5 and (**c**), (**d**) pH 8 with R = 0.1 and 1 under oxic or anoxic conditions. Refer to each panel for corresponding condition (e.g., HA, pH 5, R = 0.1, oxic). The label H represent*s* hausmannite. Note that the inverse peaks in the patterns were caused by over-subtracted by cerium dioxide (CeO_2) signal remaining in the empty Kapton capillary.

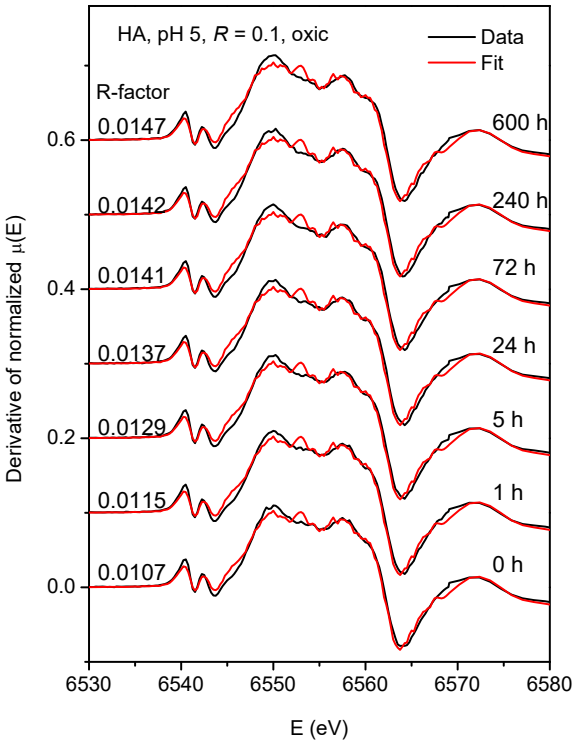


Fig. S4. Mn K-edge XANES LCF analysis of the HA system at pH 5 with r = 0.1 under oxic condition as an example.