Electronic Supplementary Information

Reaction Induced Morphology Changes of Tetracene and Pentacene Surfaces.

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**Fig. S1.** PM-IRRAS spectra of tetracene films reacted with maleic anhydride for time intervals. The colored lines denote the following: 8 h reaction (blue dashed) and pristine tetracene (blue solid), 45 h reaction (red dashed) and pristine tetracene (red solid). The intensity (y-axis) is normalized such that the pristine samples have an absorbance of 1.

**Fig. S2.** SEM images 100 nm tetracene thin films reacted with maleic anhydride for extended periods of time. (a-b) 40 °C, 7 d; (c) 40 °C, 10 d; the inset is higher magnification of the same surface. (d) Corresponding PM-IRRAS spectra. The colors denote the following: 100 nm pure tetracene thin film (black), 40 °C, 7 d reaction with maleic anhydride (blue), 40 °C, 10 d reaction with maleic anhydride adduct (red).
**Fig. S3.** EDX spectra, elemental map, and atomic composition. Sample is a tetracene film that has been completely reacted with maleic anhydride adduct imaged at 5 keV electron energy. Oxygen percentage is 9.9%, close to the 12% predicted for C$_{22}$H$_{14}$O$_3$.

**Fig. S4.** (a-d) Different magnification SEM images of a 100 nm tetracene thin film reacted with maleic anhydride at 50 °C for 2.5 h. SEM image was taken at 5 keV electron energy.
Fig. S5. EDX quantification spectra for the entire surface (top) and subdivided sections (bottom) along with oxygen percentage in each region. The sample is a 100 nm tetracene thin film reacted for 8 h maleic anhydride and imaged at 1 keV electron energy.
**Fig. S6.** Monte Carlo simulation model of X-ray penetration into a sample comprised of 2 nm of $\text{C}_2\text{O}_3$ on top of 98 nm carbon. Top is emitted X-rays, while the bottom shows the electron trajectories in the sample.

**Fig. S7.** EDX spectra and percentage oxygen of 100 nm tetracene thin films that have been reacted with maleic anhydride for 36 h imaged at 1-5 keV electron energy.
Fig. S8. EDX spectra and percentage oxygen of 100 nm tetracene thin films imaged at 1-5 keV electron energy. Bottom right image is EDX spectra and percentage oxygen of 100 nm tetracene thin film that has been reacted with maleic anhydride for 45 h imaged at 1 keV electron energy.
Fig. S9. PM-IRRAS spectra of a 50 nm pentacene thin film reacted with maleic anhydride. The colors denote the following: unreacted 50 nm pentacene (blue), 50 °C, 2.5 h reaction (red).