The Metal/Organic Interface in Cobalt/Vinylidene Fluoride Heterostructures

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Supplementary Information

X-ray Photoelectron Spectroscopy

XPS spectra were collected on Co/VDF heterostructures prepared with and without breaking vacuum after the Co deposition. As the Ar^+ ion etch removed Co material, the signal associated with the Co(2p) peak became weaker. To find the positions of the Co(2p) peaks for the spectra taken close to the Co/Pt seed layer interface, the individual spectra were first run through a 20 point smoothing algorithm. Figure S1a shows an as-collected spectrum (black line) and a smoothed spectrum (red line). Once smoothed, the first derivative is taken to better identify the peak location. Figure S1b shows the first derivative of both an as-collected spectrum (black line) and the first derivative of a smoothed spectrum (red line). A Gaussian peak is then fit to the first derivative of the smoothed spectra to find the location of the peaks. An example is shown in figure S1c.
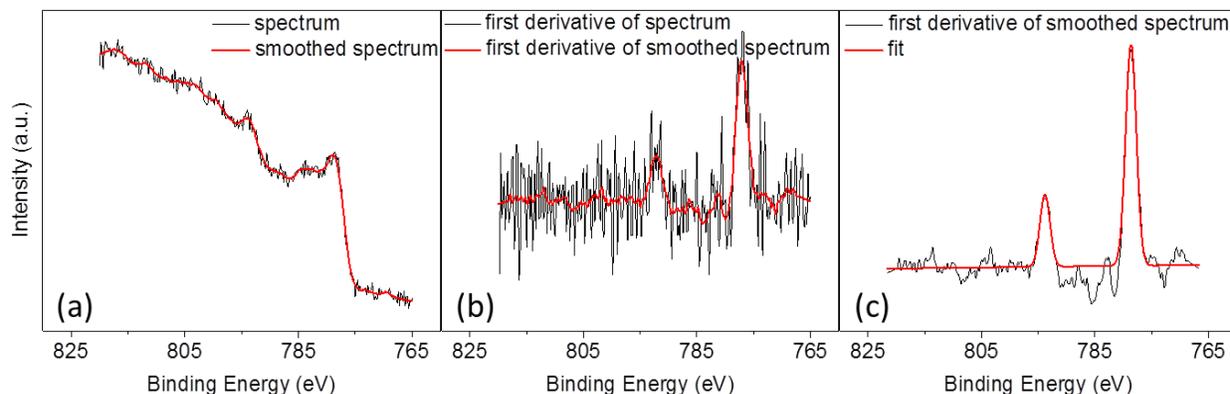
Figure S1. Peak extraction for Co(2p) spectra collected close to the Co/Pt interface. (a) Example of Co(2p) spectrum, both as-collected (black) and smoothed (red). (b) First derivative of as-collected (black) and smoothed (red) spectrum. (c) First derivative smoothed Co(2p) spectrum (black) and Gaussian fit (red).

For Co(2p) depth profiling, such as that shown in figure 5 of the manuscript, the Pt(4f) peak was monitored throughout data collection. Figure S2 shows the Pt(4f) spectra collected after each Ar$^+$ ion etch, indicating a very small peak which increases in height as material is etched away. When the height of the Pt(4f) peak saturates, the Ar$^+$ etch has reached the Pt layer, and spectra collection is stopped. PMOKE measurements on these samples after XPS measurements confirm this, as they show no magnetic signal, confirming the etching of the Co.
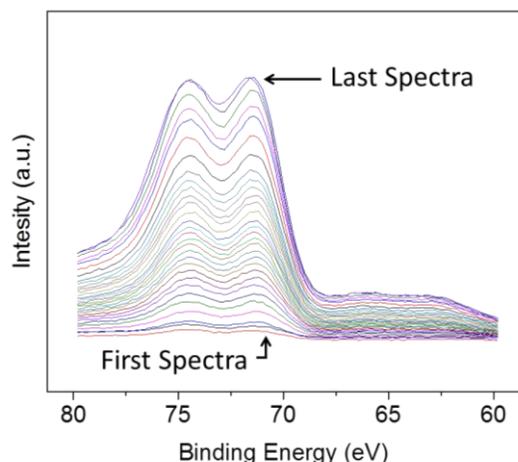
Figure S2. XPS spectra of Pt(4f) peaks. Between each spectrum, material is etched away, and the magnitude of the peak increases. When the intensity of the Pt(4f) peak stops increasing after subsequent etches, it is assumed that the etching process has reached the Pt seed layer and no Co remains.

For the F(1s) depth profiling, such as that shown in figure 6 of the manuscript, the F(1s) peak was monitored throughout data collection. Figure S3 shows the F(1s) spectra collected after each Ar$^+$ ion etch. The peak starts large, with its magnitude remaining relatively large after each Ar$^+$ ion etch, until enough VDF oligomer has been removed that the spectra are collected near

the Co/VDF interface. As the interface is approached, the F(1s) peak begins to diminish, and when it disappears entirely, it is inferred that the VDF oligomer film has been etched away and the Co/VDF interface has been reached.
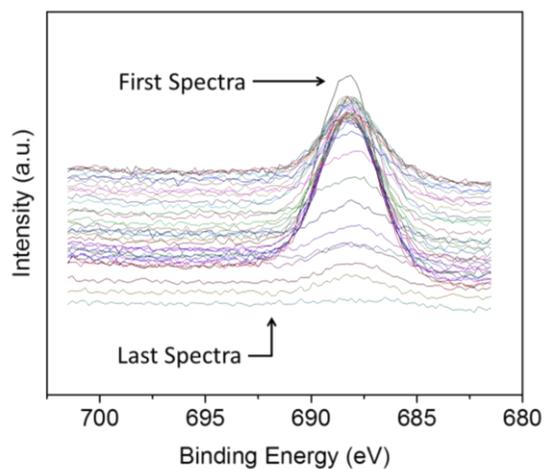
Figure S3. XPS spectra of F(1s) peaks. Between each spectrum, VDF oligomer is etched away, and the magnitude of the peak decreases. When the intensity of the F(1s) peak disappears, it is assumed that the etching process has reached the Co/VDF interface, and no VDF oligomer remains.