1. EDS results



Figure S1 - In (A) and (B), EDS measurements are shown for the area of Figure 2A and 2B, respectively. The measurements show an increase in aluminum and oxygen after coating, as expected for the alumina layer.

## 2. QCM results



Figure S2 - QCM results for 16-PHA SAM growth on ALD alumina experiment. Data was filtered with a moving average of 300 data points. (A) Change in resonance frequency of resonance mode 3. (B) Change dissipation factor of resonance mode 3.



Figure S3 - QCM results for 16-PHA SAM growth on ALD alumina experiment. Results for 87000 89000 seconds showing the switch back to buffer solution after the 24 hour period. The red line in both graphs indicates the point at which the 16-PHA SAM solution was switched to buffer solution. (A) Change in resonance frequency of resonance mode 3 showing a small increase in frequency after switch to buffer solution. (B) Change dissipation factor of resonance mode 3.

## 3. Hydrophobic SAMs

Samples were coated with alumina by ALD process. For self-assembly process we used SAMs with a hydrophobic functional group Octadecylphosphonic ( $C_{18}H_{39}O_3P$ , CAS number 4724-47-4 purity 97%, for 24 hours at ambient conditions). After ALD coating the samples displayed complete wetting (contact angle < 5 °). After self-assembly process, the contact angle increased to ~115 ° as seen in figure S 4.



*Figure S4 – Image from Theta Lite of water drop on ALD coated sample with* Octadecylphosphonic SAM. The drop displays hydrophobic contact angle on the surface. The measured contact angle for the sample is displayed above the drop.