

Figure S1. In-situ FTIR differential Spectra of TMA/water deposition on spin coated PP film. Negligible interactions between TMA and PP were observed. The peak intensity of CH₃ asymmetric stretching at ~2960cm⁻¹ is not detectable ($< 2 \times 10^{-4}$) after 1st TMA exposure.

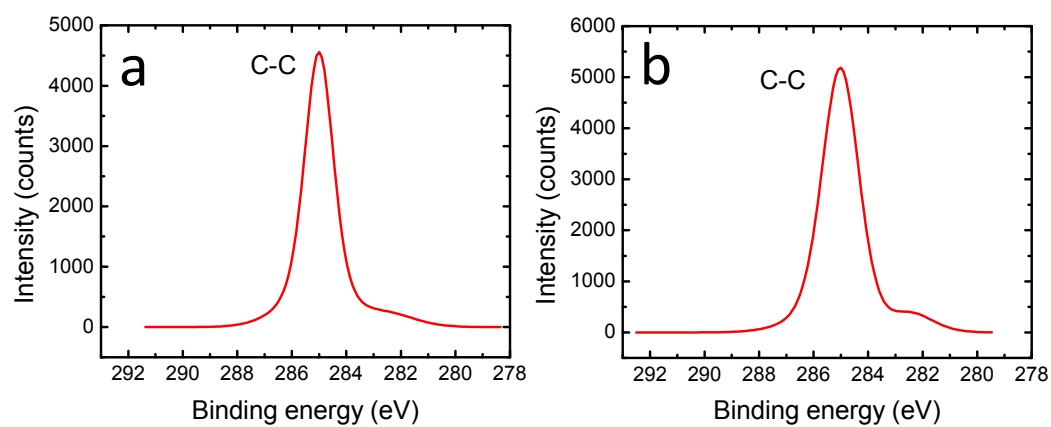


Figure S2. C 1s peak detail scan of PP film on Si wafer, before (a) and after (b) TMA/water soaking. No observable change in peak shape. The TMA/water soaked PP film showed no detectable Al.

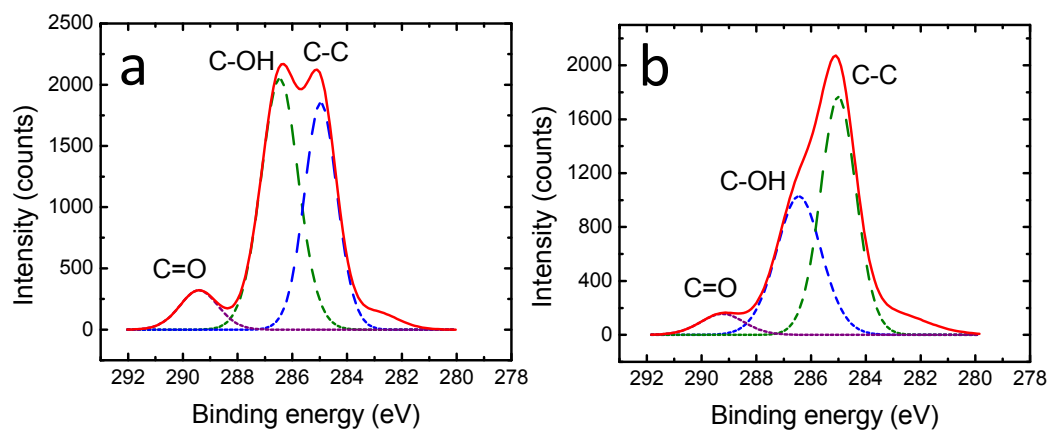


Figure S3. C 1s peak analysis of PVA film on Si wafer, before (a) and after (b) 1 cycle of TMA/water soaking. Significant decrease of C=O and C-OH features support the conclusion that TMA reacts with C-OH and C=O in the PVA.

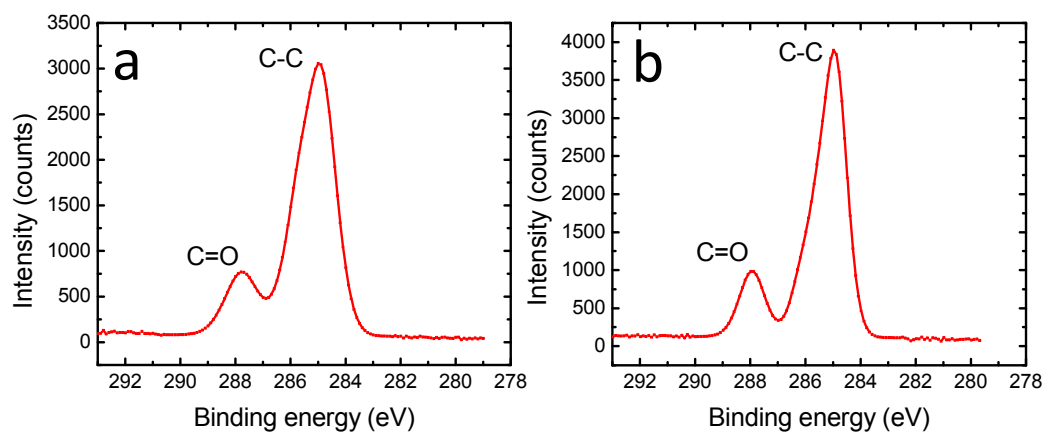


Figure S4. C 1s peak analysis of Nylon-6 film on Si wafer, before (a) and after (b) 1 cycle of TMA/water soaking.

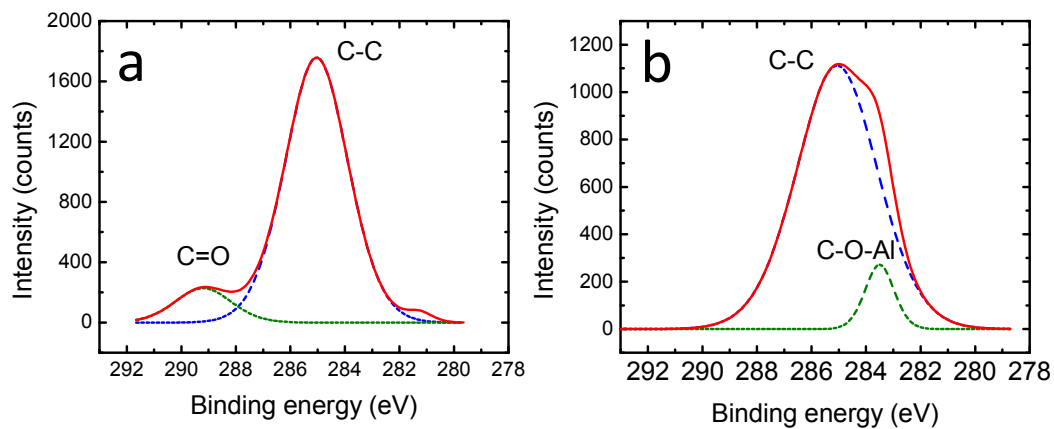


Figure S5. C 1s peak analysis of PBT film on Si wafer, before (a) and after (b) 1 cycle of TMA/water soaking. Complete removal of C=O and the formation of C-O-Al is consistent with the in-situ FTIR analysis.

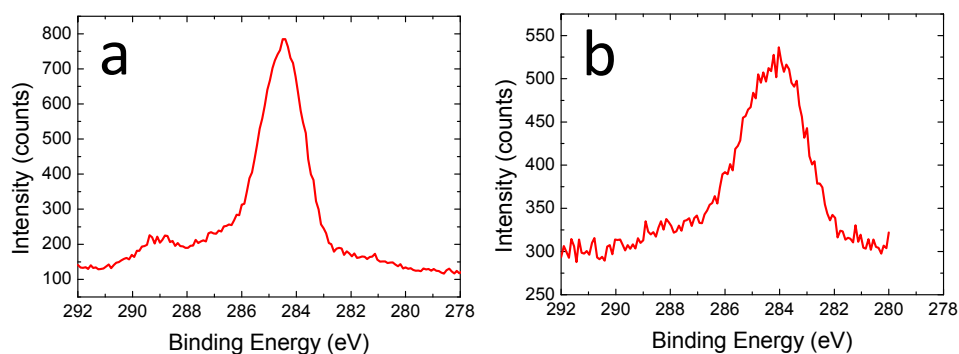


Figure S6. (a) The XPS detail scans of carbon 1s collected from the PLA film on Si wafer. The peak at 284.5 eV is corresponding to the C-C bond in the PLA, while the peak at 289 eV is related to the C=O bond in the PLA. (b) The XPS data collected from the TMA/water infiltrated PLA film on Si wafer. The peak at 289 eV is removed, corresponding to the reaction between the TMA with C=O bond in the PLA.