

Supplementary Material For:

Sequential Infiltration Synthesis of Al_2O_3 in Polyethersulfone Membranes

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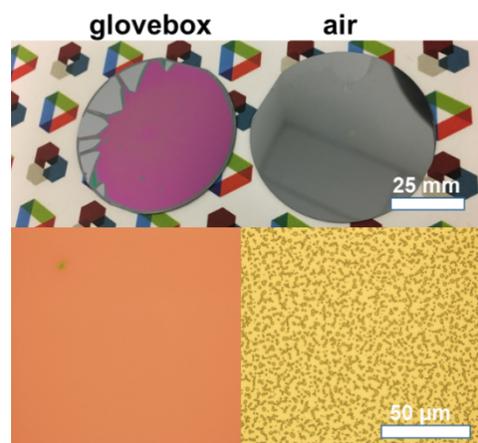


Fig. S-1: Photographs (top) and optical micrographs (bottom) of PES films on silicon prepared by spin-coating from DMF solutions in an Ar glovebox (left) and in air (right). Glovebox preparation yields uniform flat films, whereas air preparation gives rough films induced by ambient humidity.

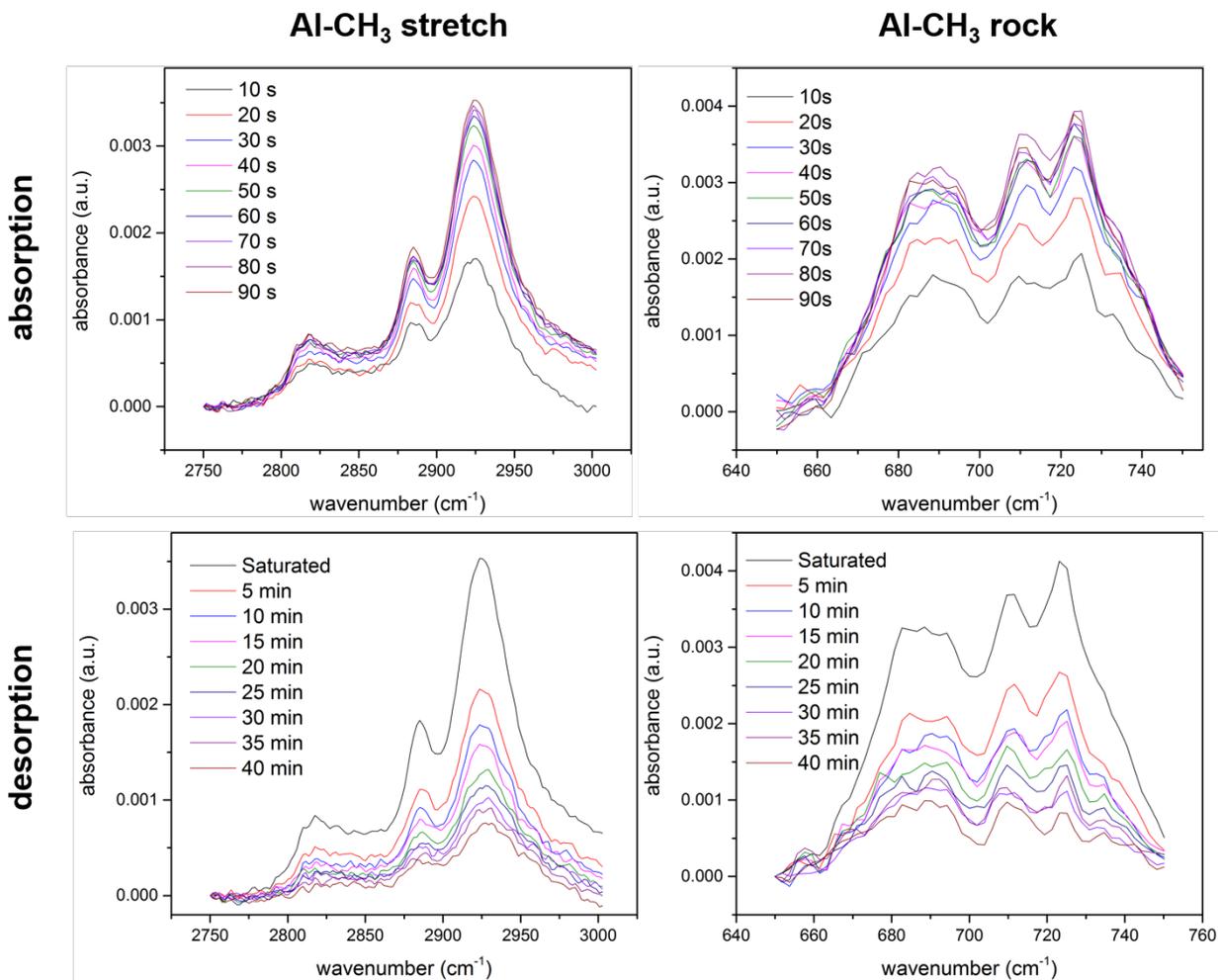


Fig. S-2: Baseline-corrected FTIR absorbance spectra for integration.

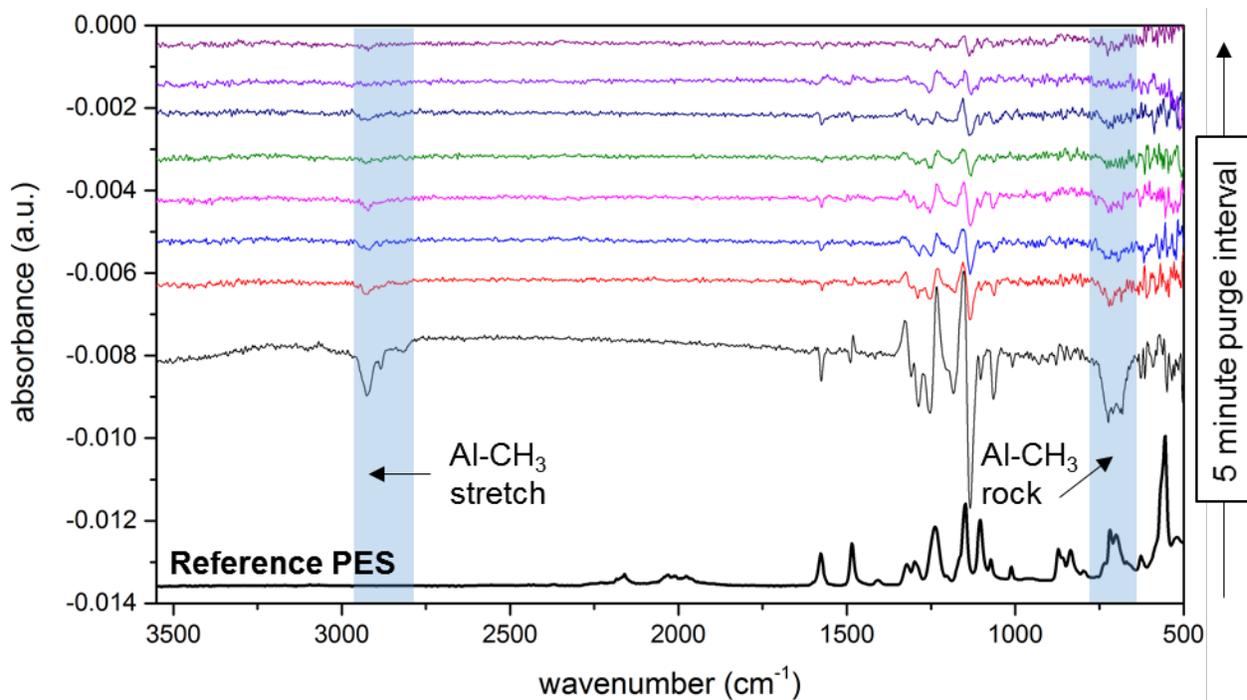


Fig. S-3: FTIR difference spectra versus TMA purge time recorded at five-minute intervals. The first spectrum is referenced to the 90-second cumulative TMA exposure spectrum.

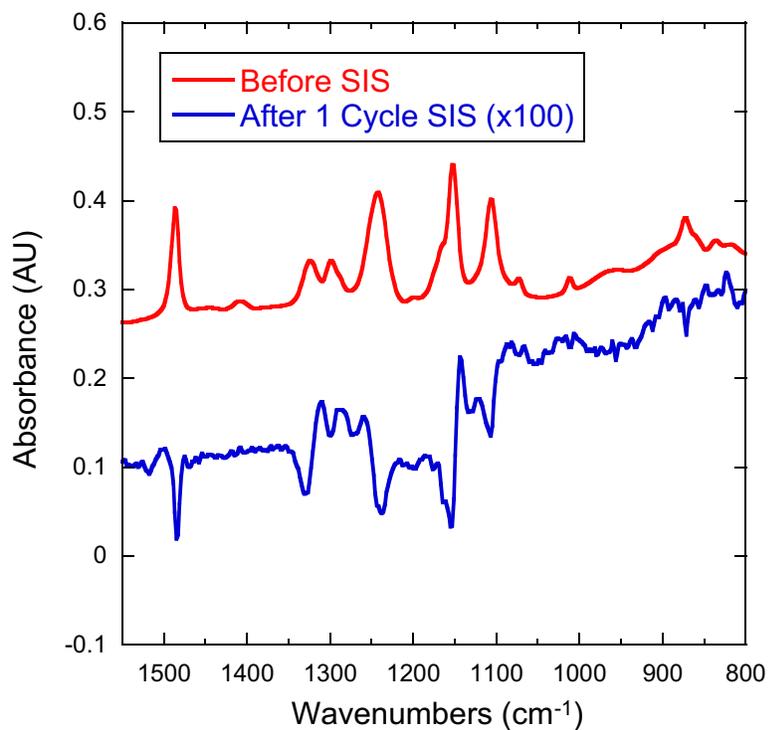


Fig. S-4: FTIR spectrum prior to SIS (red) showing the PES peaks, and following a complete Al_2O_3 SIS cycle (blue) referenced to the red spectrum. The blue spectrum has been scaled by

100×, and the negative going peaks represent functional groups in the PES film that were consumed during the Al₂O₃ SIS process.

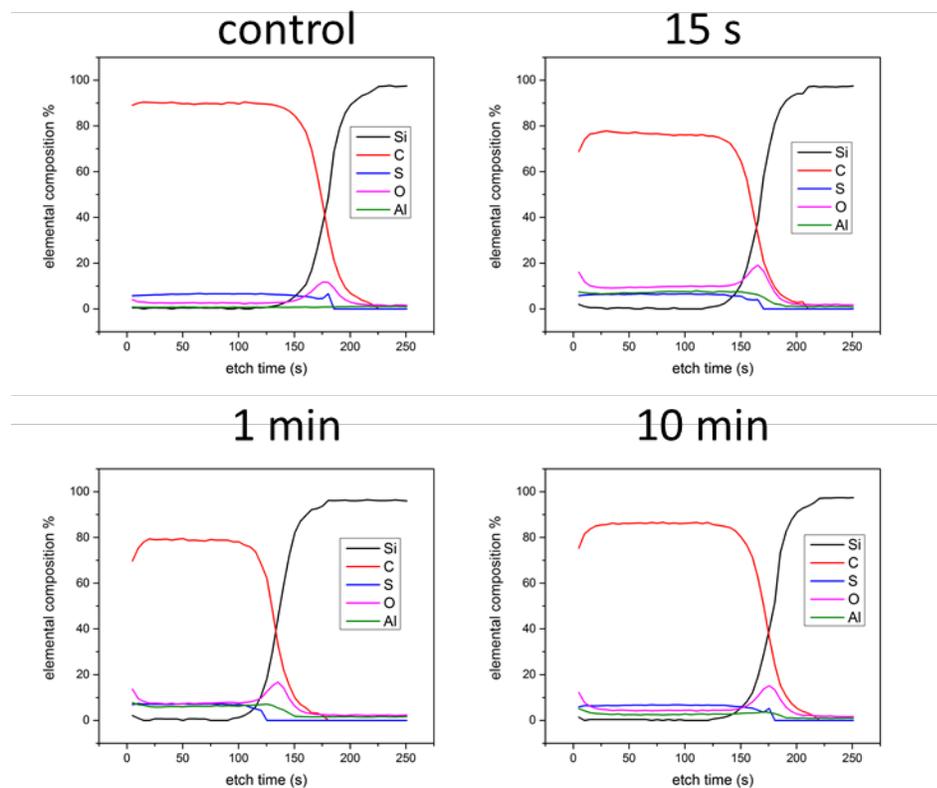


Fig. S-5: Depth-profiled elemental composition of hybrid PES-Al₂O₃ films generated via XPS measurements over etch time.

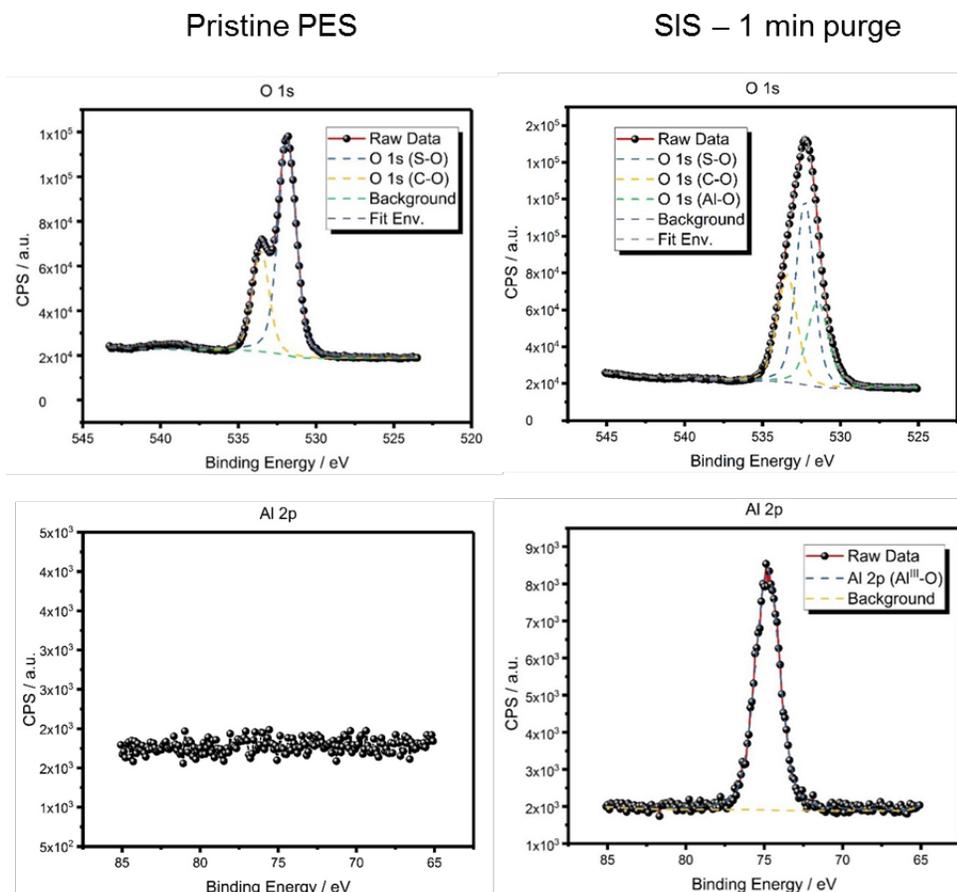


Fig. S-6: O 1s and Al 2p peaks of pristine PES and SIS-modified PES film (one-minute purge) surfaces via XPS. The introduction of signal at the Al 2p region and of the O 1s Al-O confirms the presence of Al₂O₃.

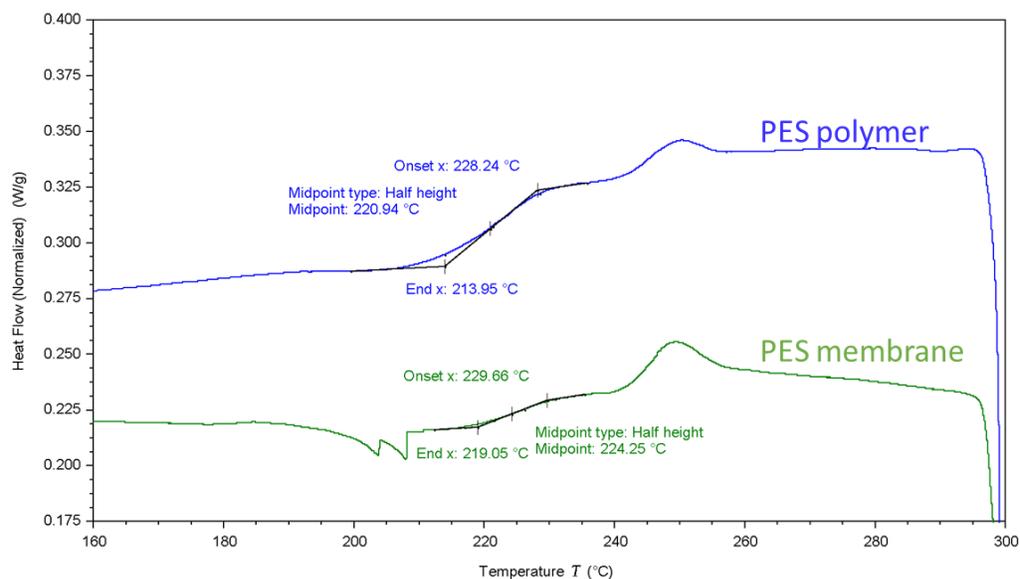


Fig. S-7: Differential scanning calorimetry confirms that both the PES polymer stock and the commercially procured membranes have similar glass transition temperatures well above the SIS operating temperature of 110 °C.

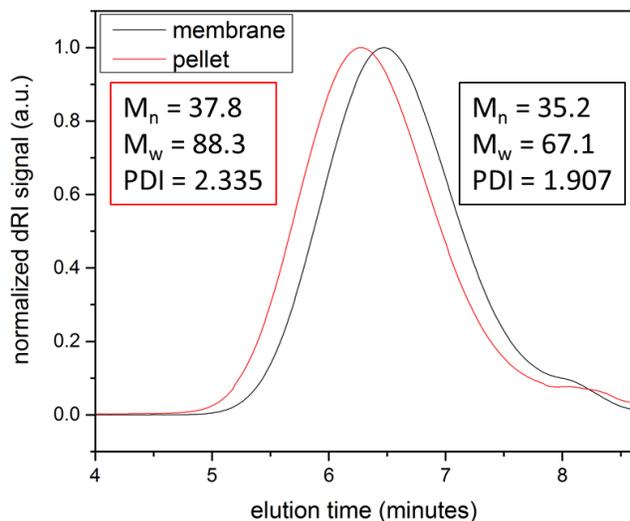


Fig. S-8: SEC measurements confirm similar molecular weight distributions between the PES

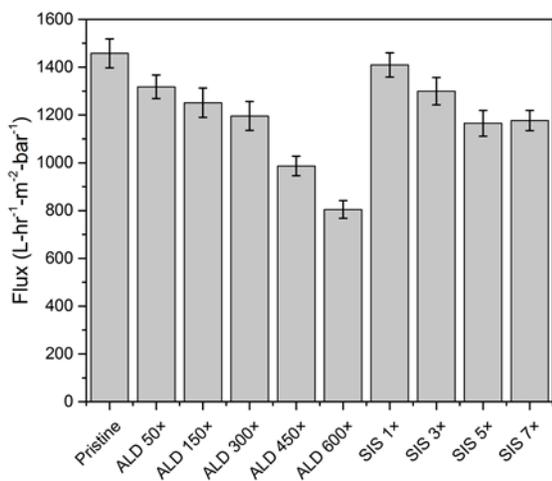


Fig. S-9: Filtration measurements of the processed membranes presented in pressure-normalized flux units.

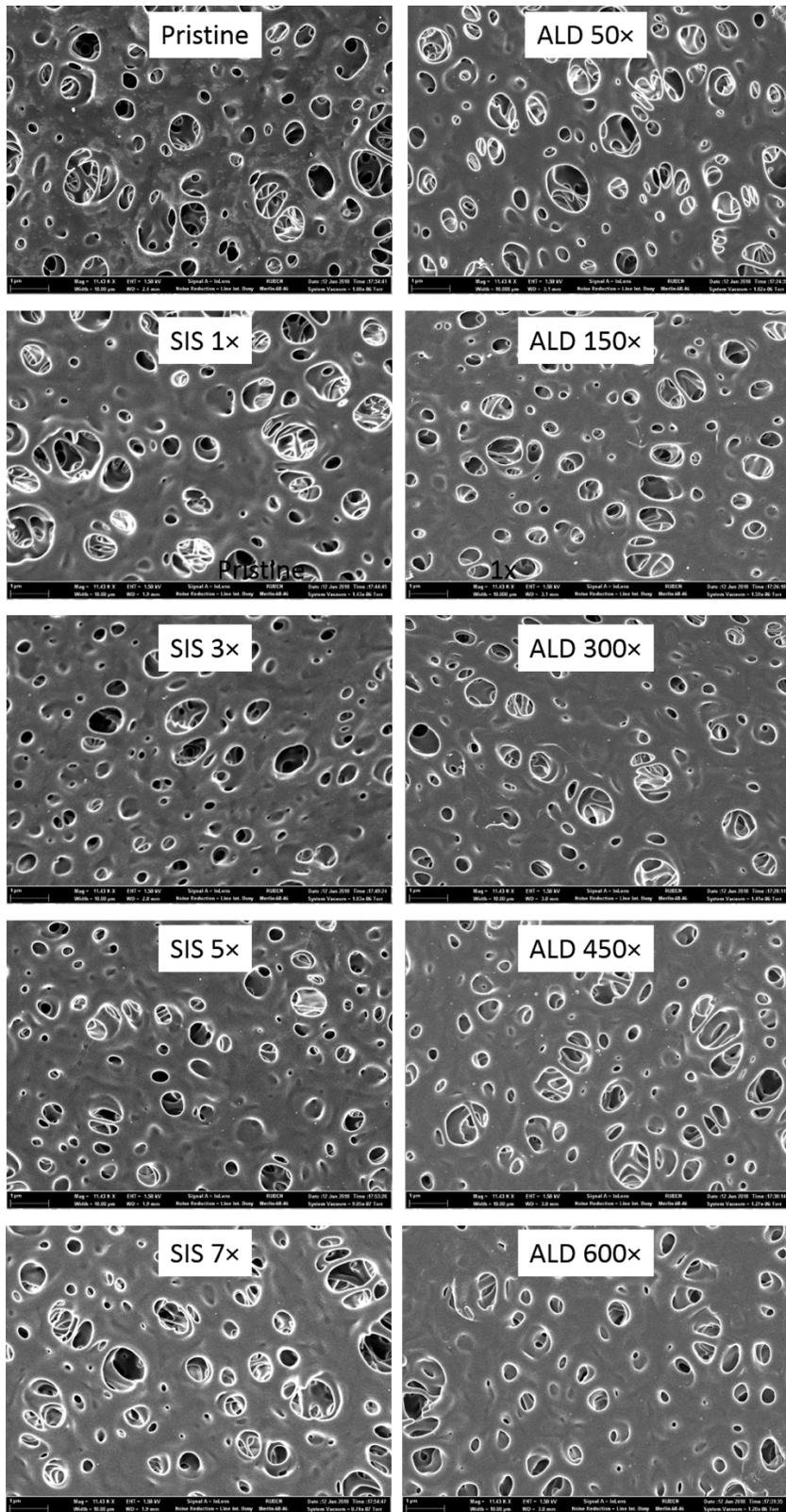


Fig. S-10: SEM images of modified PES membrane top surfaces.