Supplementary Information for:

Natural channel protein inserts and functions in a completely artificial, solid-supported bilayer membrane

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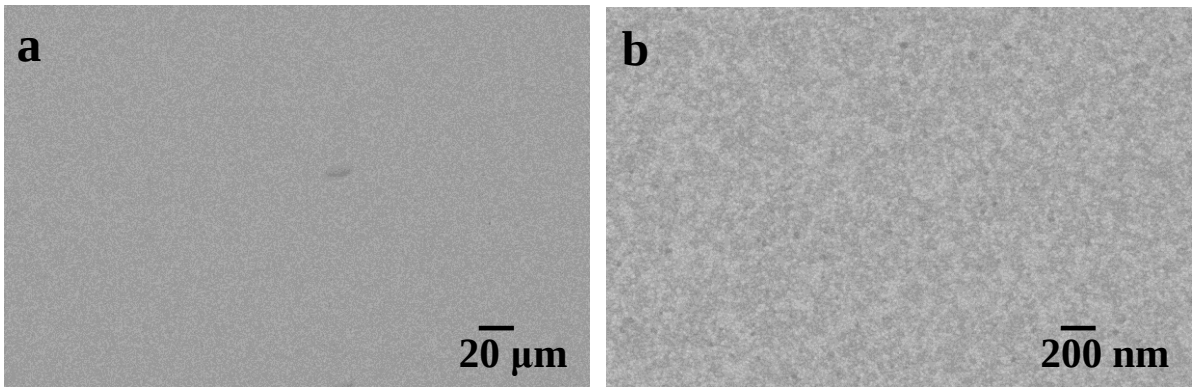
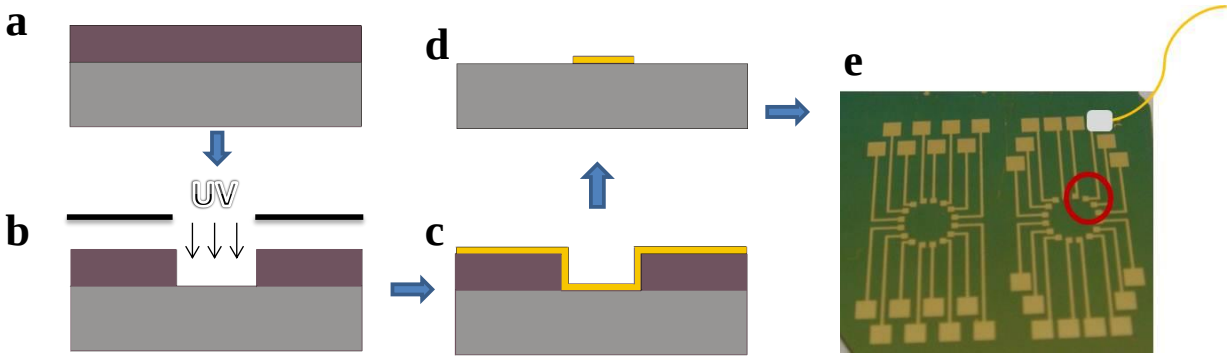
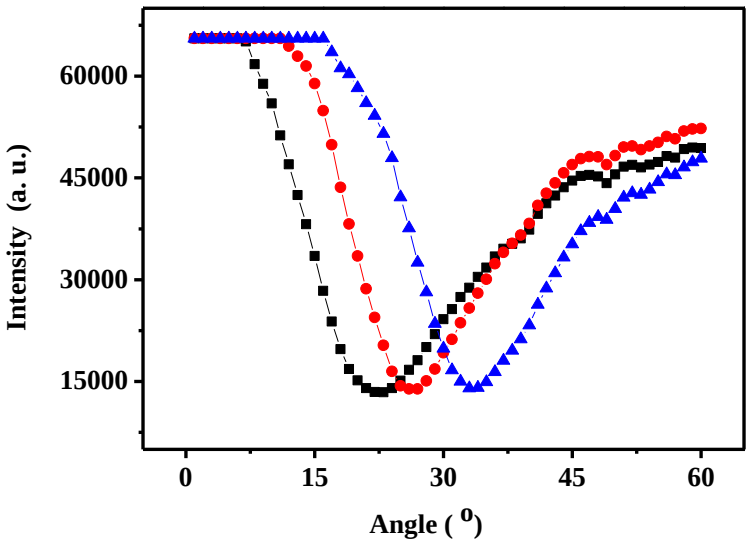


Supplementary Figure S1 | Surface morphology of a PB-PEO TSSBM. (**a**) Scanning electron microscopy (SEM) images of the PB-PEO TSSBM prepared by consecutive LB-LS transfers. (**b**) Enlarged view of (a).

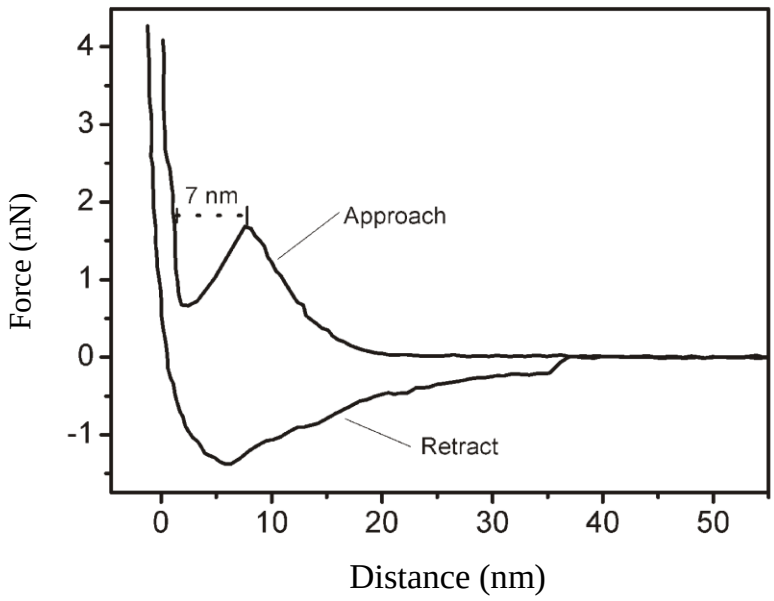


Supplementary Figure S2 | Procedure to generate a patterned gold surface. (**a**) Silicon wafer covered with a photoresistant layer. (**b**) Generation of pre-patterned silicon wafer upon UV irradiation. (**c**) Deposition of gold film by electrothermal evaporation. (**d**) Removal of the nonirradiated photoresistant layer. (**e**) Final patterned gold surface (gold wire connected to patterned gold using silver paint).

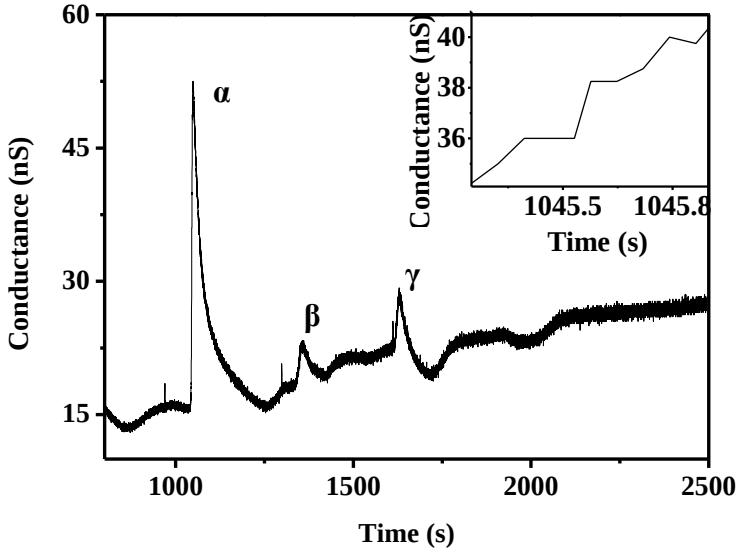
Normally, for conductance measurement with molecular protein incorporated, the membrane area should be 100 to 200 µm in diameter. It is difficult to make a PDMS cell with such a small hole and not have air bubbles after adding the solution. We therefore chose another method to decrease the gold surface area using UV lithography, resulting in a patterned gold surface with a gold area of approx. 0.09 mm^2). The PDMS chamber was placed on the red, circled area. The measured membrane is actually limited to the small gold area.



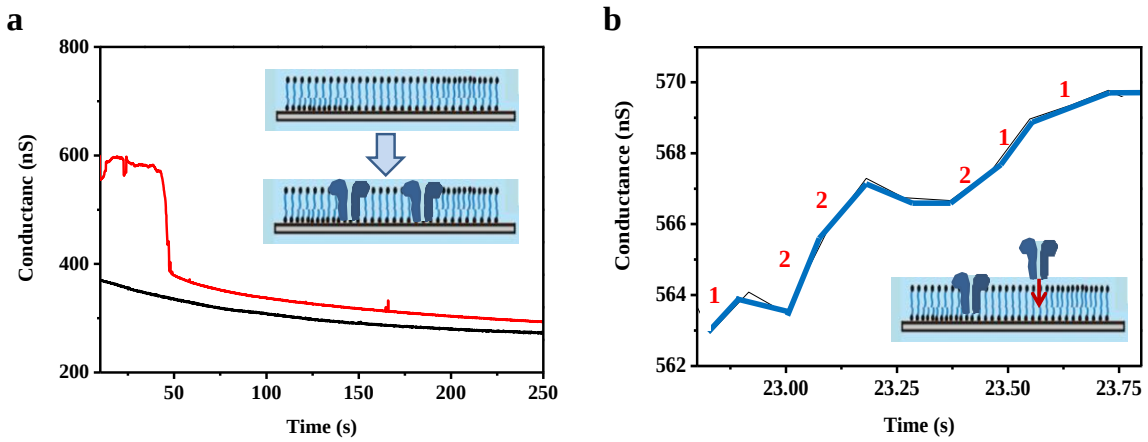
Supplementary Figure S3 | Layer thickness. Representative angular SPR spectrum of blank gold (black square), covalently attached PB-PEO-LA monolayer (red dot), and the PB-PEO bilayer (blue triangle) measured in ultrapure water. Curves were fitted using a refractive index for the polymer film of n = 1.5, with a mean monolayer thickness of 6.1 ± 0.4 nm and a mean bilayer thickness of 11.3 ± 0.5 nm.



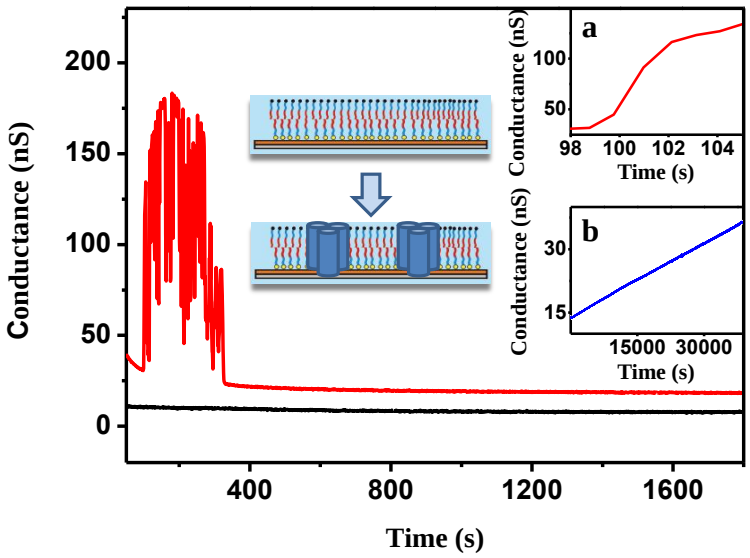
Supplementary Figure S4 | AFM force distance measurements for characterisation of the polymer TSSBM. A characteristic peak appears in the force curve at a distance of about 9 nm, in intermittent contact mode using an approaching force F of ~ 1.6 nN obtained with an oxide sharpened silicon nitride tips (NP-S; Veeco Instruments, Germany).



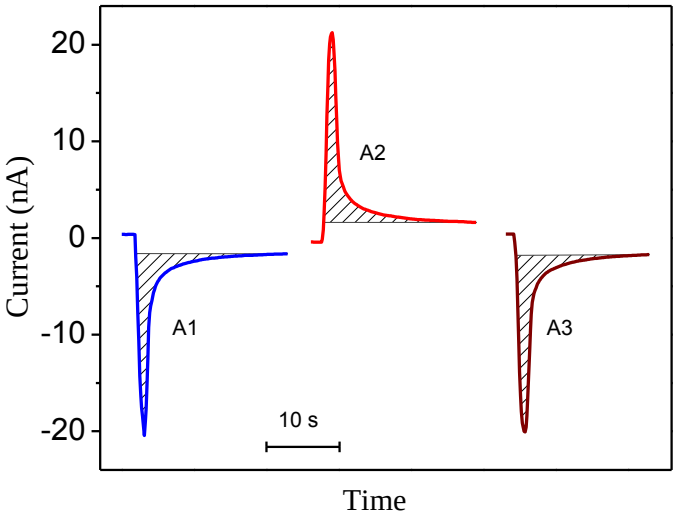
Supplementary Figure S5 | αHL insertion in a polymer TSSBM. Primary protein insertion (main peak, α). Other, smaller amounts of protein were inserted (supplementary protein insertion peak, β and γ). Insert is a zoom of the rise of the main peak.



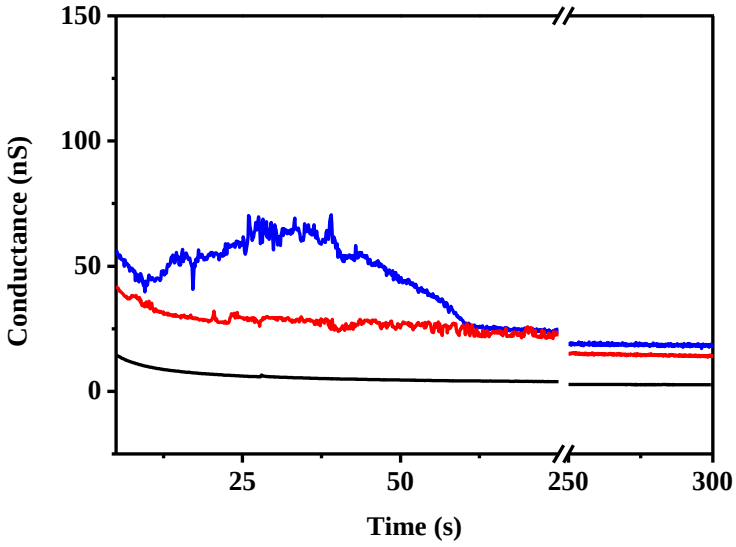
Supplementary Figure S6 | Conductance measurement across a lipid SSBM. (**a**) Characteristic time course of the conductance across the lipid SSBM free of (black curve) and in the presence of αHL (red curve) under 40 mV. (**b**) Enlarged view of the stepwise increase of the characteristic time course of the conductance across the lipid solid-supported bilayer membrane in the presence of αHL.



Supplementary Figure S7 | Conductance measurement across PB-PEO TSSBM. Characteristic time course for conductance across the PB-PEO TSSBM before (black curve) and after (red curve) addition of OmpF at 20 mV. Inset: (**a**) Enlarged view of the increasing part of the characteristic time course of the conductance across the PB-PEO TSSBM upon addition of OmpF, and (b) The effect of detergent (2% n-octyl-oligo-oxyethylene) on the conductance of pure PB-PEO TSSBM with time.



Supplementary Figure S8 | Comparison between the areas of current peaks under inverted periodic voltage. Time dependent current variation upon reversed voltage is applied to the polymer TSSBMs.



Supplementary Figure S9 | Electrical stability of a PB-PEO TSSBM. Characteristic time course of the conductance (PBS buffer, 20 mV) across the PB-PEO TSSBM transferred at 25 mN m^{-1} (blue curve), 30 mN m^{-1} (red curve) and 35 mN m^{-1} (black curve).