# Hyper-thin organic membranes with exceptional $H_2/CO_2$ permeation selectivity: importance of ionic crosslinking and self-healing

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## Supplementary Information

**Materials and Methods.** Poly[1-(trimethylsilyl)-1-propyne] (PTMSP) (Gelest, Inc., Morrisville, PA), poly(acrylic acid) (Mw=240,000) (Sigma-Alrdich, St. Louis, MO) and *n*-octadecyltrichlorosilane (OTS) (Sigma-Alrdich, St. Louis, MO) were used as obtained. House-deionized water was purified using a Millipore Milli-Q-filtering system containing one carbon and two ion-exchange stages. A Nima 612D film balance (Nima Technologies, Coventry England) was used for all monolayer experiments. Methods that were used for modifying the surface of silicon wafers with OTS, preparing cast films of PTMSP, measuring film thicknesses by ellipsometric and by atomic force microscopy, and measuring gas permeabilities were similar to those previously reported.[1] The refractive index values used for the silicon oxide, OTS and LB layers were 1.46, 1.41 and 1.41, respectively. Methods used for fabricating LB films, and measuring surface pressure-area isotherms and surface viscosities were similar to those previously described.[2,3] In all cases, monolayers were spread using ca. 55 μg of calix[n]arene on an aqueous subphase of 515 $cm^2$ from chloroform solutions that were ca. 1 mg/mL. [**Caution**: Because of its combustibility, permeance measurements for $H_2$ should be carried out in a fume hood for safety].

References:

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