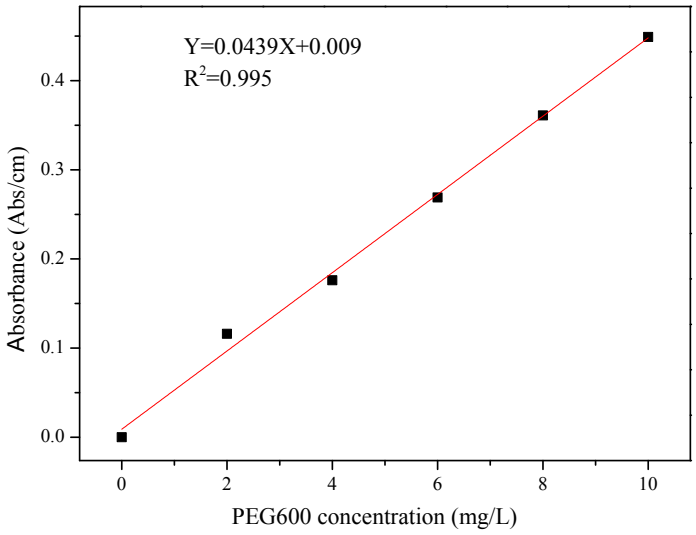
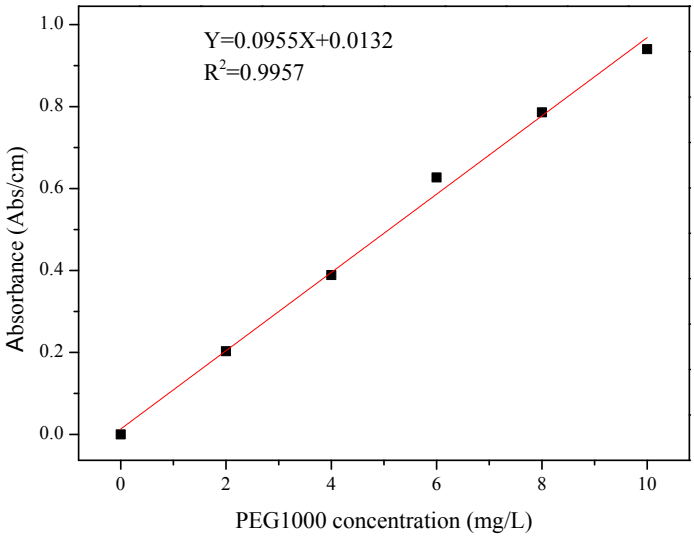
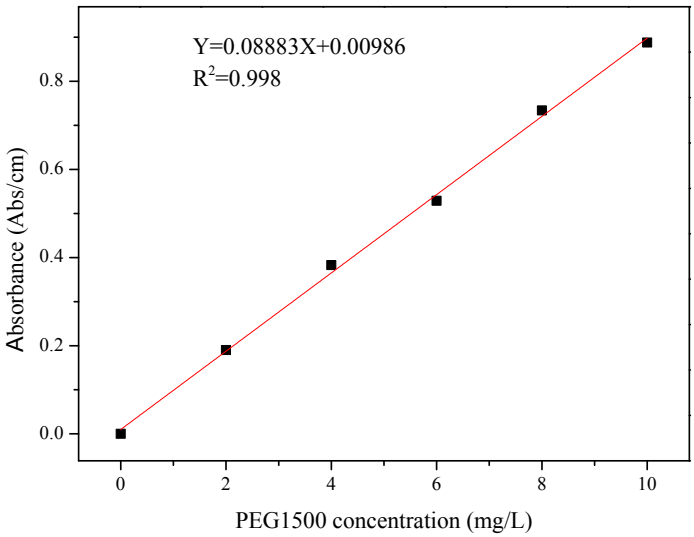
The standard curves of aqueous solutions containing PEG of different molecular weights (PEG600,λ_{max}600nm, EG1000, λ_{max}530nm, EG1500, λ_{max}560nm and EG2000, λ_{max}562nm) were determinated as follows:

First, stock solution of PEG (100mg/L) were prepared, then different volume of stock solution, ie,0.00,1.00,2.00,3.00,4.00 and 5.00mL, was moved into a flask (50mL) by pipette, and then 3.00mL $BaCl_2$ solution (5 wt.%) and 2.00 mL I_2 solution(0.05mol/L) were added into the flask, and then the mixture were diluted to 50ml. After 10 min of color reaction, the PEG solution sample was determined by a UV-3200 PCS spectrophotometer. Black reagent was used as reference and deionized water was used to prepare all the solutions.The results are shown in Fig S1.




Y=0.0955X+0.0132
R2=0.9957
Absorbance (Abs/cm)
PEG1000 concentration (mg/L)
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10


Y=0.08883X+0.00986
R2=0.998
Absorbance (Abs/cm)
PEG1500 concentration (mg/L)
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0.2
0.4
0.6
0.8
0
2
4
6
8
10

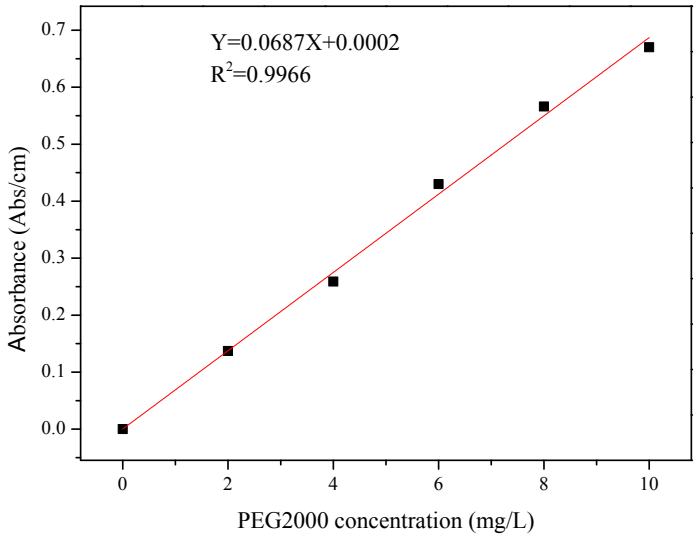

Fig.S1 Standard curves for the aqueous solutions containing PEG of different weights

The XPS spectra were collected using a Kratos Axis-Ultra spectrometer, using a monochromatic Al Kα source (1487 eV) operating at 15 kV and 3 mA, 10^{-7} Pa vacuum in the analyzer chamber and an analysis spot size of 300 μm × 700 μm. Spectrometer pass energy of 160 eV was used for full scan, while 20 eV pass energy was used for the high resolution scans. The binding energy scale of the spectrometer was calibrated using the metallic Cu 2p3/2 lines and Ag Fermi Edge of the respective reference metals.

The XPS analysis reveals the changes in the composition of the skin layer of the membranes after the addition of MIL-53(Al). As showed in Fig.S2, the peak of ~71.900 eV binding energy for aluminum shows that the aluminum occurs on the surface of MIL-53(Al)/PMIA membrane, indicating the successful doping of MIL-53(Al) on the surface of modified membranes.

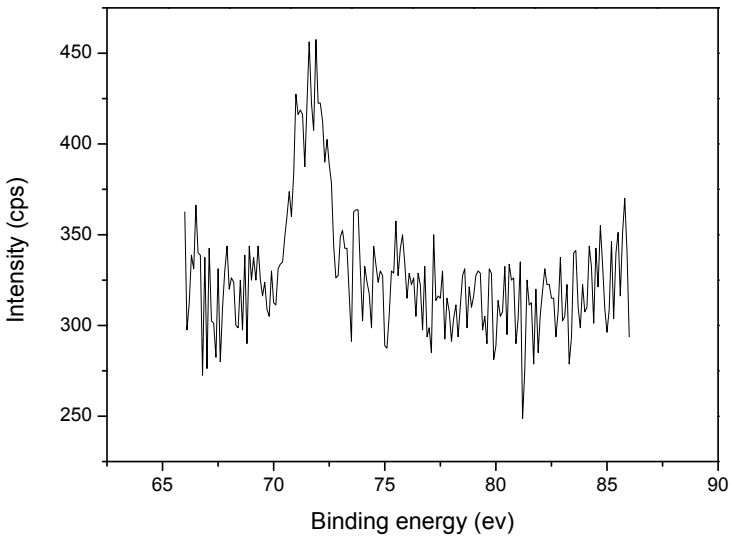

Fig. S2 The Al spectrum of M-1.5