Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.


# Supporting Information

## Using Intermolecular Interactions to Crosslink PIM-1 and Modify its Gas Sorption Properties

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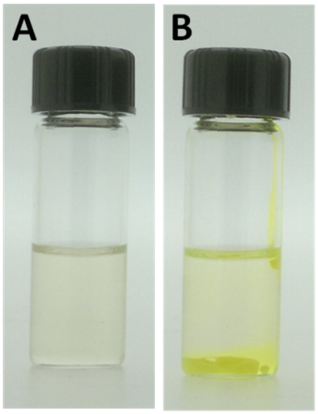


Figure S1. Addition of PIM-1 at 50 mg/mL (in DCM) to pyrene in benzene (50 mg/mL). A: Solutions before addition of PIM-1. B: After the addition of three drops of PIM-1 solution.

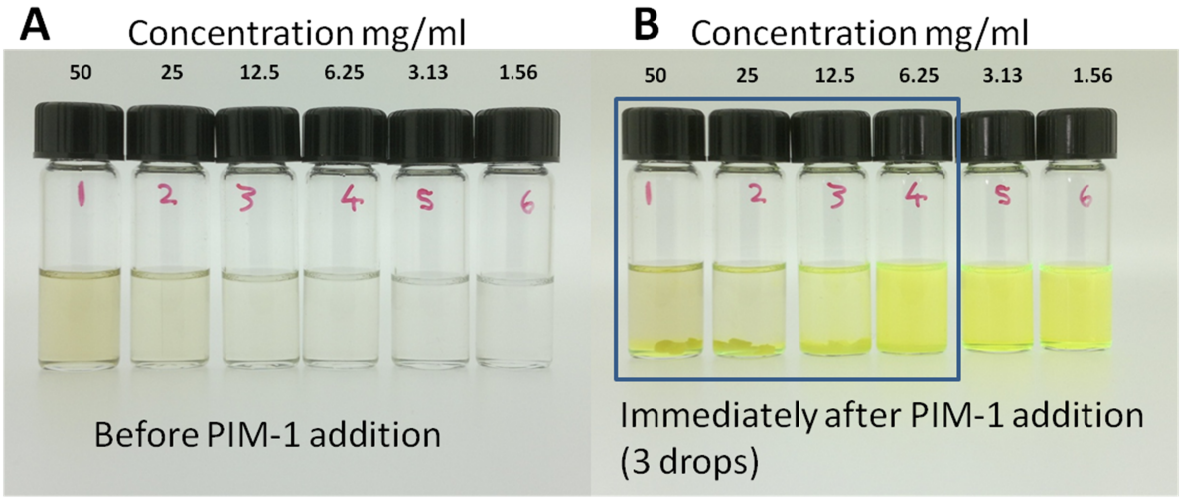


Figure S2. Effect of pyrene concentration on PIM-1 precipitation. A: Pyrene solutions (in DCM) before addition of PIM-1. B: After the addition of three drops of PIM-1 solution (at 50 mg/mL in DCM).

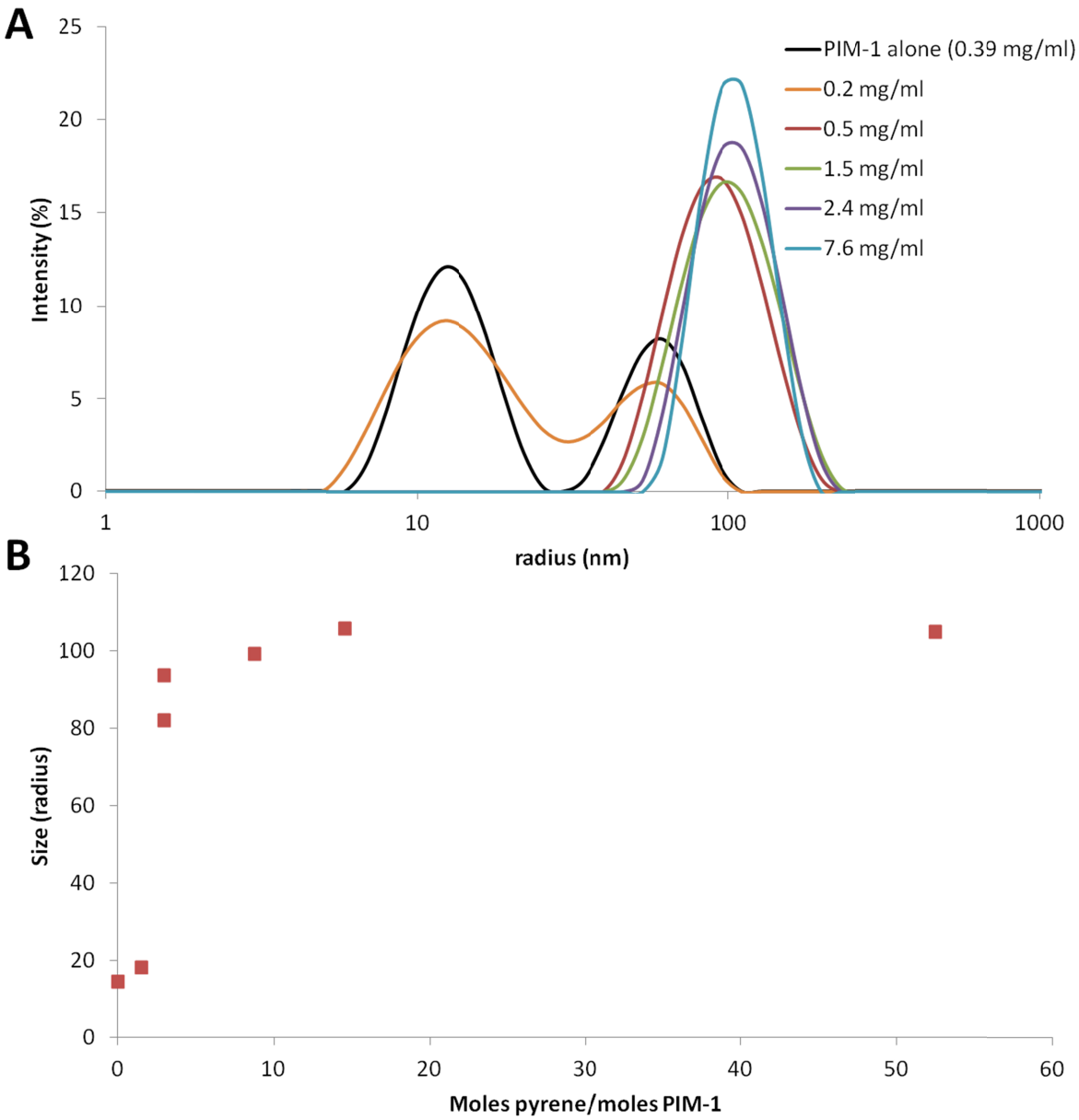


Figure S3. Analysis of PIM-1 and pyrene aggregation by dynamic light scattering (DLS). A: Size distribution plot for PIM-1 mixed with pyrene (both in DCM) at a range of concentrations. B: Relationship between the mean size of scattering objects measured by DLS and the ratio of number of moles of pyrene to moles of PIM-1 repeat unit.

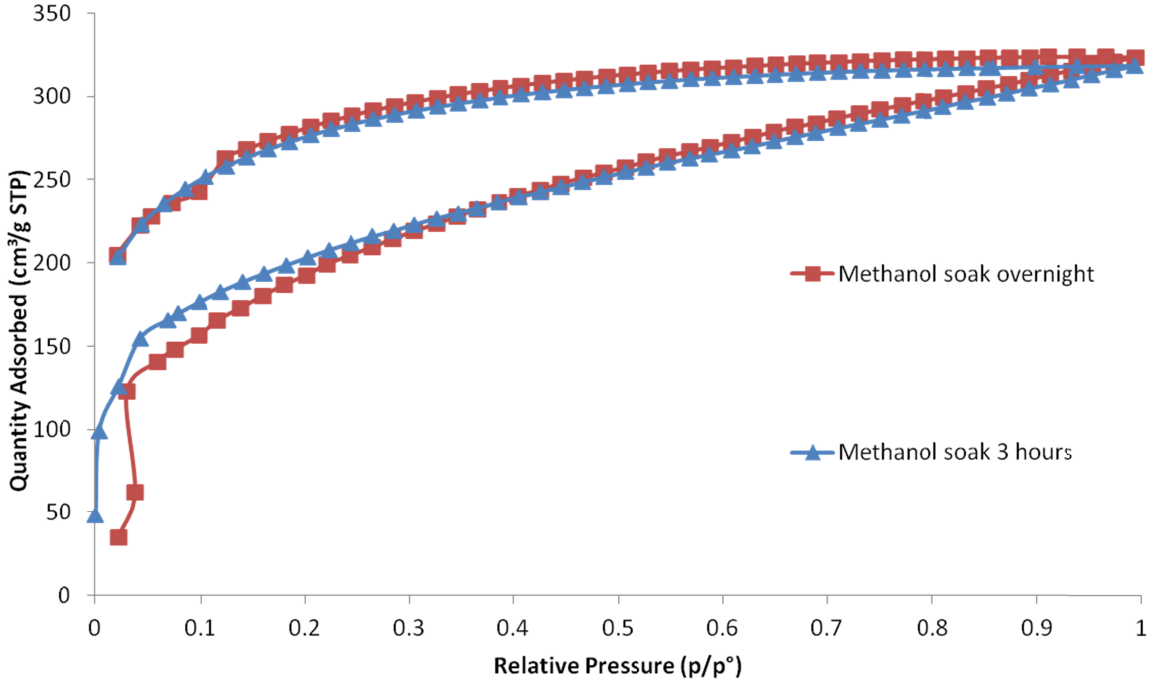


Figure S4. Effect of methanol soak on the isotherm $N_2$ of PIM-1 at 77 K.

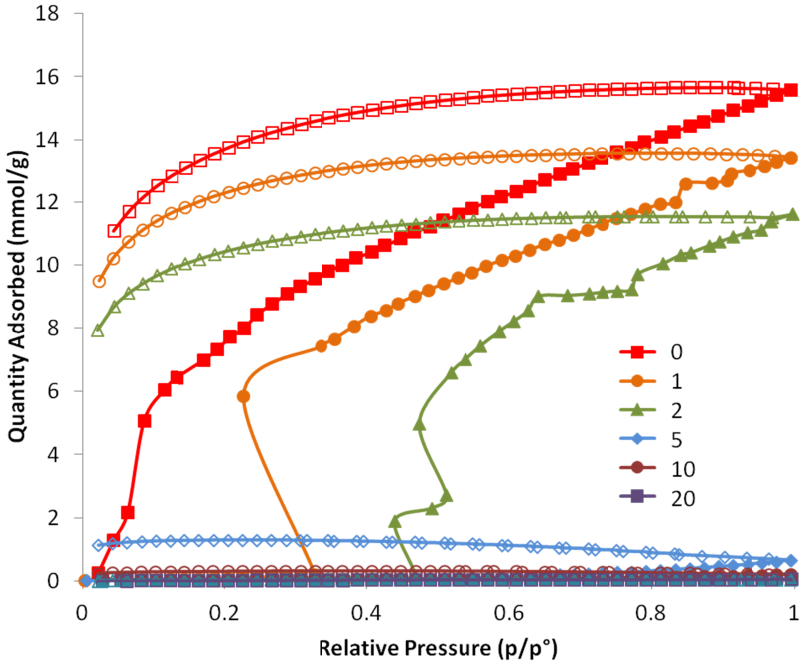


Figure S5. Gas sorption isotherms ($N_2$ 77K) for PIM-1 and pyrene blends with varying pyrene content (as indicated in the legend). While it is apparent that at relative pressures below 0.6 incomplete equilibration was occurring between some adsorption measurements, (as indicated by the decrease in relative pressure between some measurements), the maximum uptakes of the PIM-1 and pyrene blends were not affected. The incomplete equilibration at low pressures was addressed in the later experiments by increasing length of the equilibration intervals.

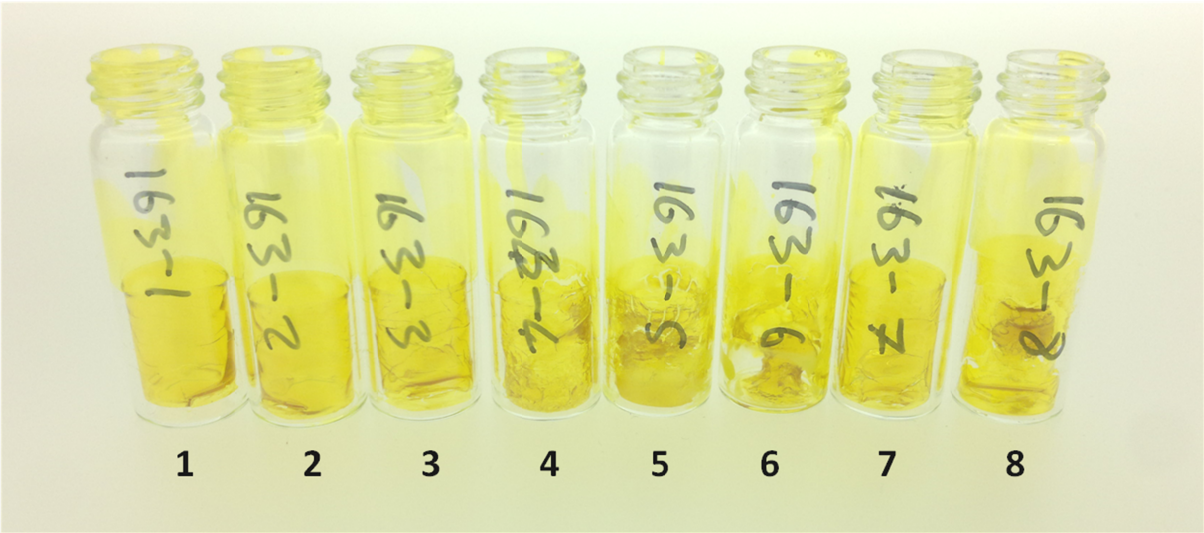


Figure S6. Photograph of PIM-1 and PAH blends upon drying to give films, increasing heterogeneity was observed with increasing additive content. 1: 100 % PIM-1. 2: 98 % PIM-1 2 % pyrene. 3: 95 % PIM-1 5 % pyrene. 4: 90 % PIM-1 10 % pyrene. 5: 80 % PIM-1 20 % pyrene. 6: 60 % PIM-1 40 % pyrene. 7: 95 % PIM-1 5 % triphenylene. 8: 80 % PIM-1 20 % triphenylene.

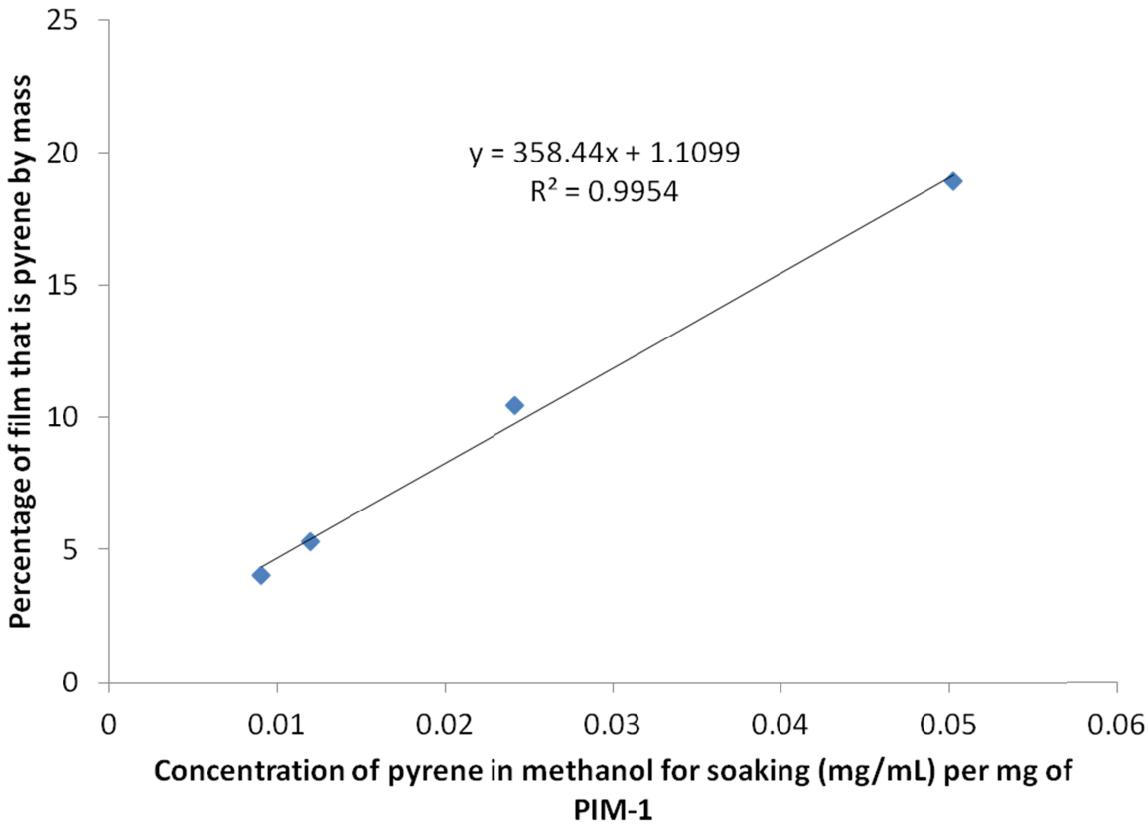


Figure S7. Relationship between the concentration of the pyrene in methanol used for post-modification, the mass of PIM-1 and the final pyrene content of the film.

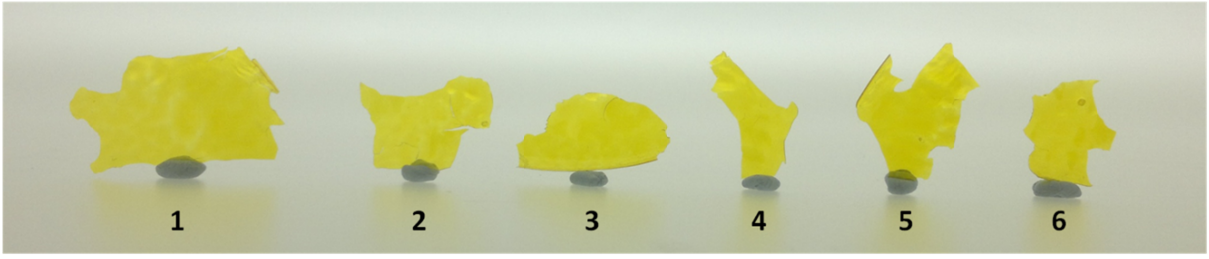


Figure S8. Visual comparison of PIM-1 films post-modified with different treatments. 1: No treatment. 2: Methanol soak for 3 hours. 3: Soaking in methanolic pyrene solution at 0.88 mg/mL for 3 hours (96.0 % PIM-1 4.0 % pyrene). 4: Soaking in methanolic pyrene solution at 1.75 mg/mL for 3 hours (94.7 % PIM-1 5.3 % pyrene). 5: Soaking in methanolic pyrene solution at 3.5 mg/mL for 3 hours (89.5 % PIM-1 10.5 % pyrene). 6: Soaking in methanolic pyrene solution at 7.0 mg/mL for 3 hours (81.0 % PIM-1 19.0 % pyrene).

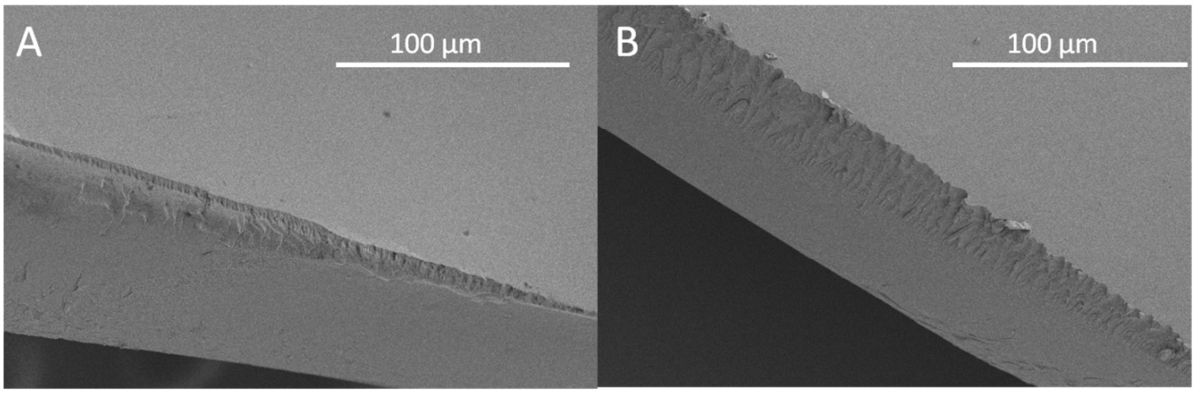


Figure S9. SEM images of (A) PIM-1 film and (B) PIM-1 film post-modified with pyrene solution 11.1 mg/mL (methanol (96 %) and DCM (4 %)).

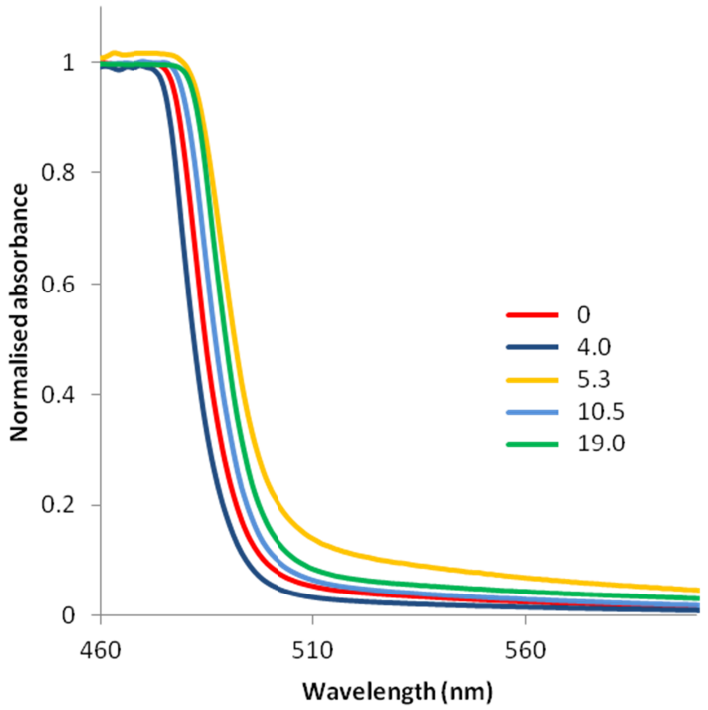


Figure S10. UV/Vis spectra for PIM-1 films post-modified with increasing amounts of pyrene.