Supplementary Information for

Artificial Solid Interphase with Polymers of Intrinsic Microporosity for Highly Stable Li Metal Anode

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**Estimated mass of PIM-1 on Li metal**

There is theoretical prediction of wet films thickness, which corresponds to the amount of loaded coating solution after doctor-blade method.\textsuperscript{51} Wet-film thickness can be obtained by the relationship as below

\[
D = \frac{1}{2} h \left( 1 + \frac{h^2 P}{6 \eta UL} \right)
\]

D = Wet film thickness

h = Height of blade (50 \, \mu m)

P = Pressure difference between top of solution and bottom of solution (43.5 Pa)

\rightarrow Pressure difference was calculated by multiplying density of solution (0.89 g/cm\textsuperscript{3}, almost same to that of tetrahydrofuran), acceleration of gravity, height of blade.

\eta = Viscosity of solution (0.48 cP, almost same to that of tetrahydrofuran)

U = Constant speed of blading (0.1 m/s)

L = Length of the plate (4 cm)

Wet-film thickness of PIM-1 layer based on the above-equation and coating condition was estimated to be as 25.5 \, \mu m. Based on this wet-film thickness, the areal mass of PIM-1 layer with respect to the concentration of coating solution could be estimated as shown in Table S1.
**Table S1.** Estimated mass of PIM-1 per area based on calculated thickness of wet film

<table>
<thead>
<tr>
<th>Weight Percent of PIM-1 solution (%)</th>
<th>Estimated mass of PIM-1 per area (μg/cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01</td>
<td>2.3</td>
</tr>
<tr>
<td>0.05</td>
<td>11.3</td>
</tr>
<tr>
<td>0.1</td>
<td>22.7</td>
</tr>
<tr>
<td>0.5</td>
<td>113.5</td>
</tr>
</tbody>
</table>
**Figure S1.** Top view images of bare Li metal (a) and 0.01 wt%, 0.1 wt% (b,c) PIM-1 coated Li metal before cycle test.
Figure S2. SEM images of (a) bare Cu foil and (b) PIM-1 0.1 wt% coated Cu foil after first Li deposition under 3.0 mA cm$^{-2}$ at 1.5 mA h cm$^{-2}$.

After Li deposition on bare Cu foil (Fig. S2a), we found dendritic growth of Li deposits formed on the Cu foil, while PIM-1 coated Cu foil showed a smooth electrodeposited Li metal on the Cu foil (Fig. S2b).
References