Electronic Supplementary Material (ESI) for Chemical Communications.

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.[S1] Wet-film thickness can be obtained by the relationship as below

$$D = \frac{1}{2}h(1 + \frac{h^2 P}{6\eta UL})$$

D = Wet film thickness

h= Height of blade (50 μm)

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

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

η= 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 μm. 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

Weight Percent of PIM-1 solution (%)	Estimated mass of PIM-1 per area (μg/cm^2)
0.01	2.3
0.05	11.3
0.1	22.7
0.5	113.5

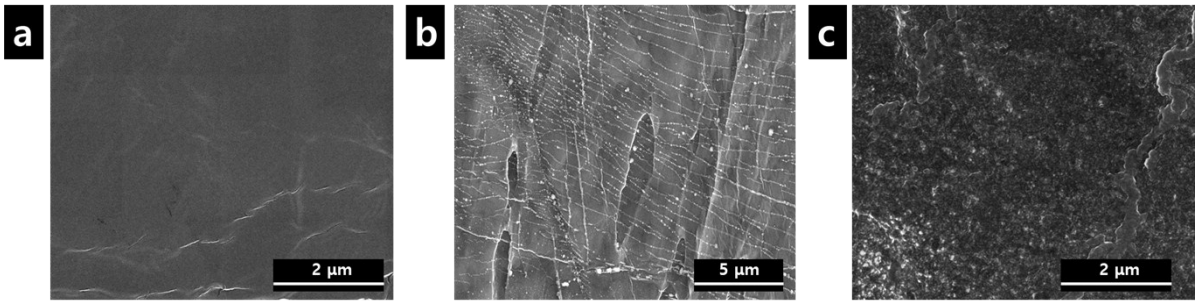

Figure S1. Top view images of bare Li metal (a) and 0.01 wt%, 0.1 wt% (b,c) PIM-1 coated Li metal before cycle test.

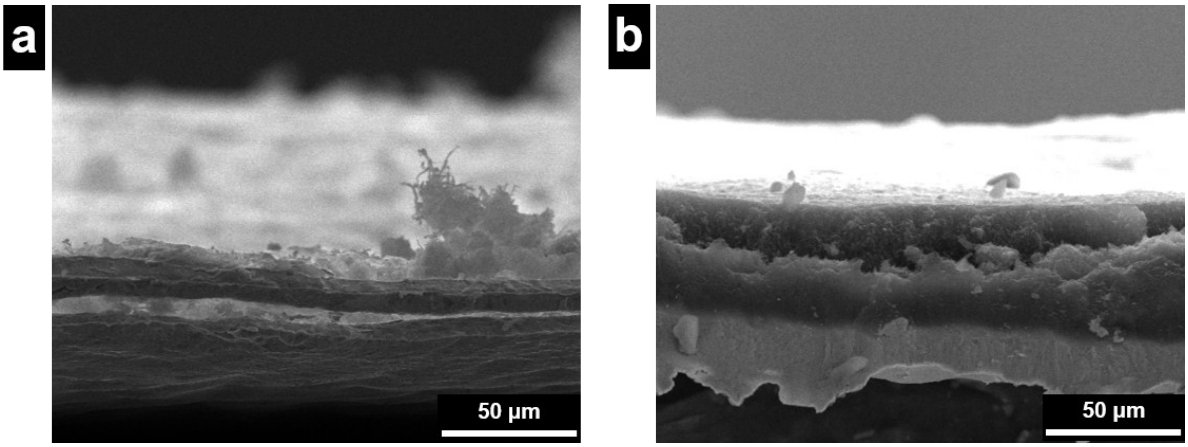

Figure S2. SEM images of (a) bare Cu foil and (b) PIM-1 0.1 wt% coated Cu foil after first Li deposition under 3.0 mA cm^{-2} at 1.5 mA h cm^{-2}.

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

S1 Y. T. Chou, Y. T. Ko and M. F. Yan, *J. Am, Ceram. Soc.*, 1987, **70**, C-280.