# Supplementary Information for

## Fabrication of porous imidazole polymerized ionic liquids with fast ion diffusing kinetics for super lithiation anode material in lithium-ion batteries

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## Results and Discussion

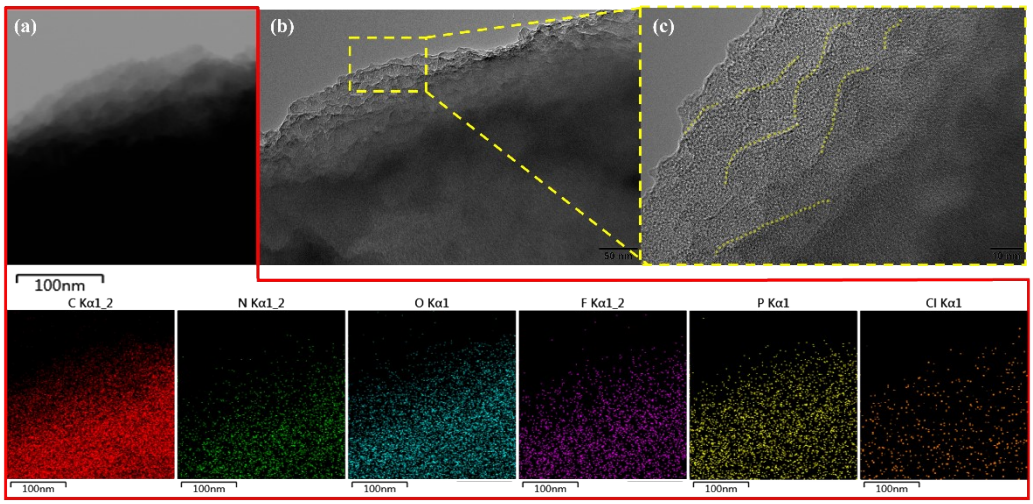


**Figure S1.** The EDS images (a) and HRTEM results (b, c) of PILs-Im electrode after long cycling test.

**Table S1.** Rate capability between PILs-Im in this work and previous organic polymer anode materials in LIBs.

| Material | Charge capacity at low current density [mAh $g^{-1}$] | Charge capacity at high current density [mAh $g^{-1}$] | Ref. |
|---|---|---|---|
| **PILs-Im** | **727.7 at 100 mA $g^{-1}$** | **165.0 at 10 A $g^{-1}$** | **This work** |
| Tp-Azo-COF | 623 at 100 mA $g^{-1}$ | 90.76 at 2.4 A $g^{-1}$ | 1 |
| Covalent organic nanosheet | ~ 720 at 100 mA $g^{-1}$ | ~ 150 at 1.0 A $g^{-1}$ | 2 |
| Layered functionalized covalent triazine frameworks nanosheet | 816 at 100 mA $g^{-1}$ | 186 at 10 A $g^{-1}$ | 3 |
| Layered covalent triazine frameworks | ~ 350 at 100 mA $g^{-1}$ | ~ 50 at 10 A $g^{-1}$ | 3 |
| Exfoliated Schiff base network-1 | 542 at 100 mA $g^{-1}$ | 212 at 5.0 A $g^{-1}$ | 4 |
| Covalent triazine frameworks | 1418.6 at 100 mA $g^{-1}$ | 181.8 at 10 A $g^{-1}$ | 5 |
| 2D COF polyporphyrin | 666 at 200 mA $g^{-1}$ | 195 at 4.0 A $g^{-1}$ | 6 |
| Aromatic imide benzophenone-3,3′,4,4′-tetracarboxylimide oligomer | 1074 at 42 mA $g^{-1}$ | 58 at 2.1 A $g^{-1}$ | 7 |
| Poly(chalcogenoviologen)s | 799 at 50 mA $g^{-1}$ | 252 at 2.0 A $g^{-1}$ | 8 |

**Table S2.** Binding energy of N and C elements in different bonding states.

| Potential (V vs $Li^+/Li$) | Binding Energy (eV) | | | | | |
|---|---|---|---|---|---|---|
| | Imidazole $N^+$ | Pyrrole N | Pyridinic N | imidazole C | pyridine C | methylene C |
| Pristine PILs-Im | 400.4 | 399.7 | 398.5 | 286.3 | 284.9 | 284.4 |
| PILs-Im at 1.0 V | 400.3 | 399.3 | 398.4 | 286.2 | 284.9 | 284.3 |
| PILs-Im at 0.1 V | 399.7 | 399.2 | 398.2 | 286.0 | 284.9 | 284.2 |

## References


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