# Supporting information (SI)

## A Polyzwitterionic@MOF Hydrogel with Exceptionally High Water Vapor Uptake for Efficient Atmospheric Water Harvesting

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**Contents**

## S1. Water vapor adsorption isotherms on pure LiCl, PL-3 and PML hydrogels

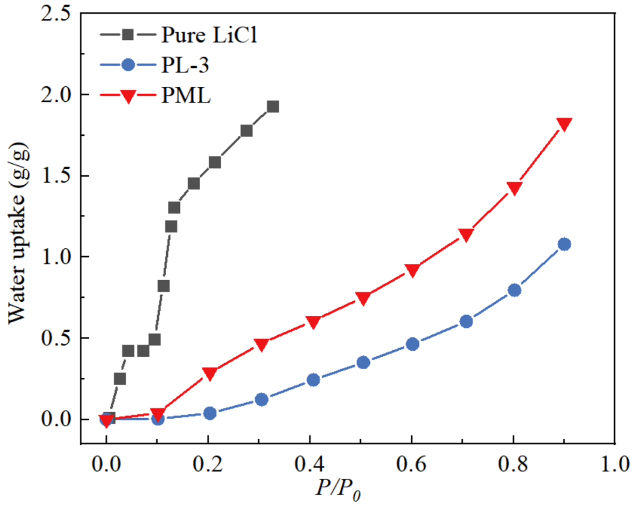


**Figure S1.** Water vapor adsorption isotherms on pure LiCl, PL-3 and PML hydrogels at 298 K.

## S2. Optical photographs of PL hydrogels after adsorption-desorption cycle

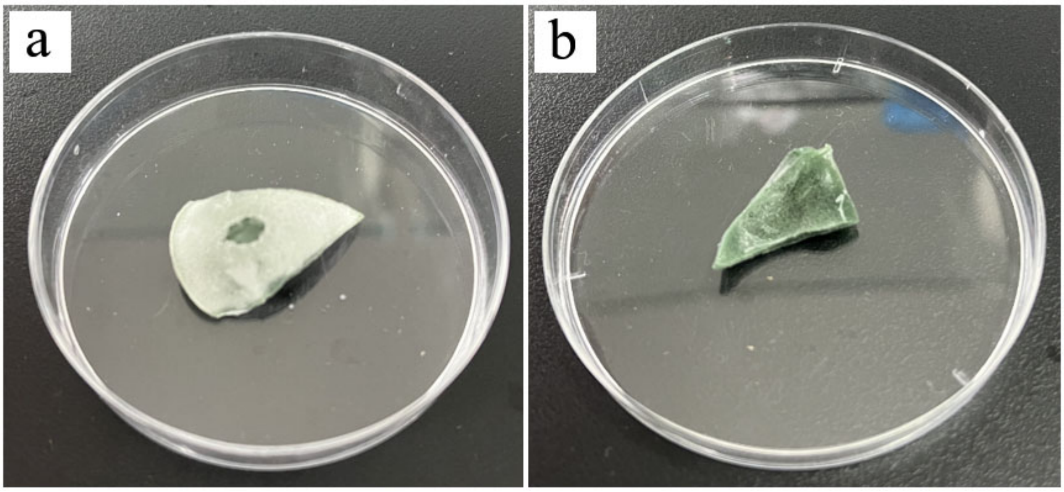


**Figure S2**. Optical photographs of (a) PL-2 and (b) PL-3 hydrogels after one adsorption-desorption cycle

**S3. Thermogravimetric and FTIR curves of PML hydrogel before and after adsorption-desorption cycle**

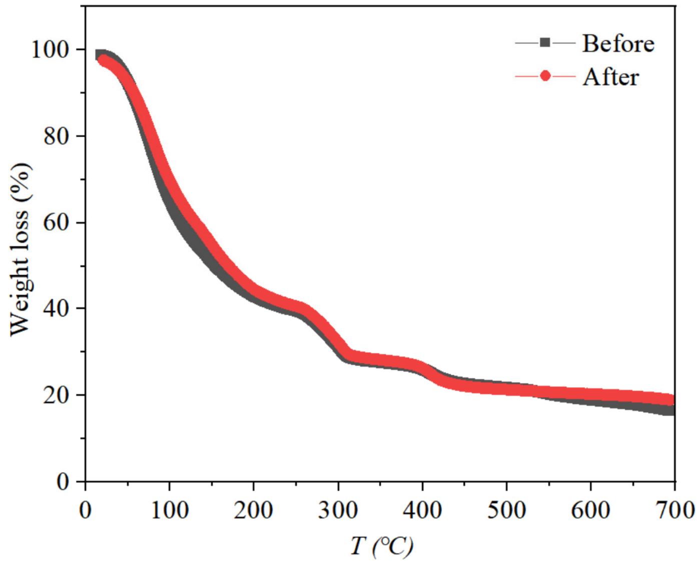


**Figure S3.** Thermogravimetric curves of PML hydrogel before and after an adsorption-desorption cycle

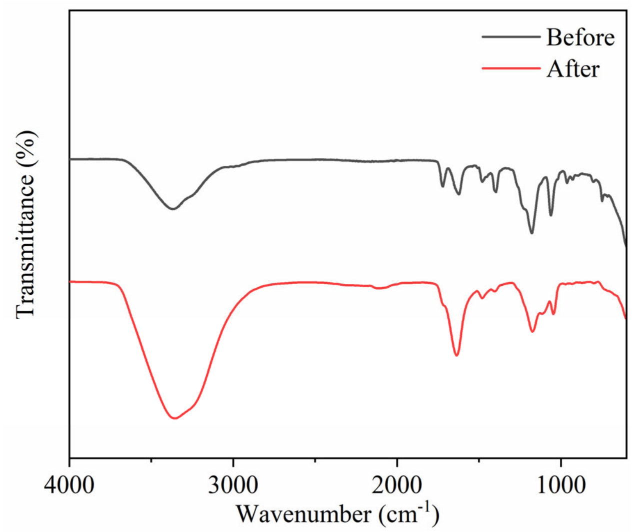


**Figure S4.** FTIR spectra of PML hydrogel before and after an adsorption-desorption cycle

## S4. $N_2$ adsorption test and water adsorption isotherm of MIL-101(Cr)

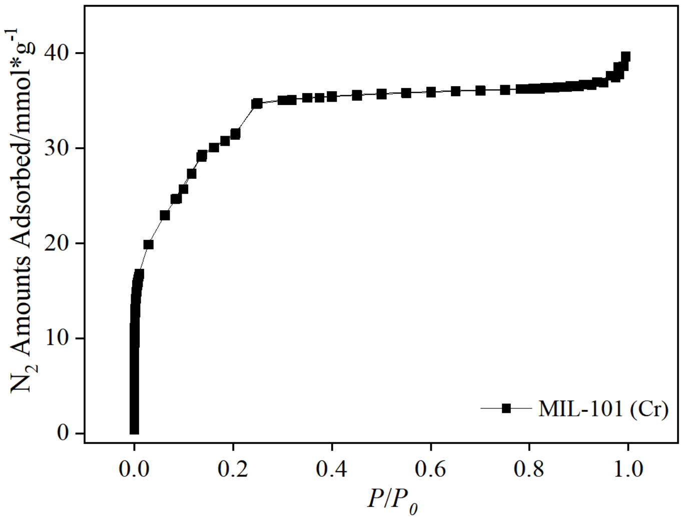


**Figure S5.** $N_2$ adsorption isotherm of MIL-101(Cr) at 298 K

**Table S1.** Pore structure parameters of MIL-101 (Cr)

| Sample | BET ($m^2/g$) | Langmuir ($m^2/g$) | Pore Volume ($cm^3/g$) |
|---|---|---|---|
| MIL-101(Cr) | 2602 | 3711 | 1.25 |

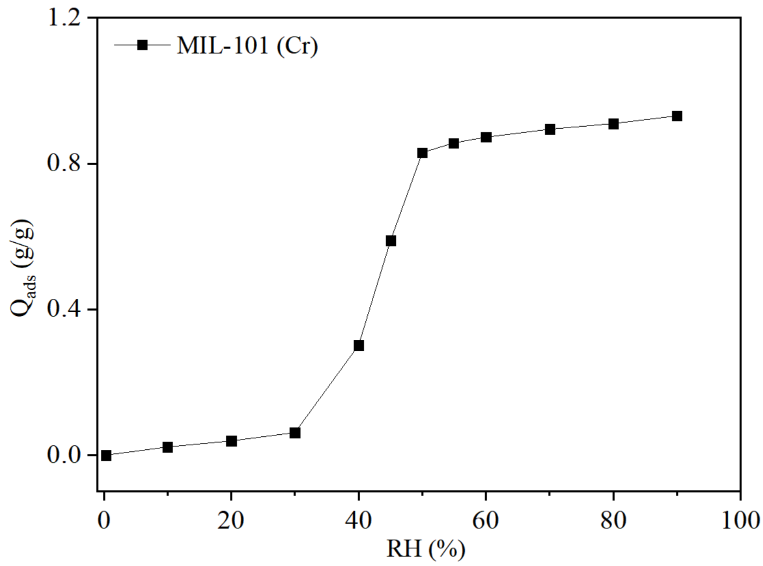


**Figure S6.** Water vapor adsorption isotherm of MIL-101(Cr) at 298 K

## S5. Comparison of the swelling ratio of the hydrogels and other materials

**Table S2.** Comparison of the swelling ratio of the hydrogels for atmospheric water harvesting in the literature

| Materials | Swelling ratio (g/g) | Swelling condition | Reference |
|---|---|---|---|
| PML | 1.82 | 90% RH moisture | **This study** |
| PML | 2.29 | DI water | **This study** |
| PML | 9.03 | 4 mol/L LiCl solution | **This study** |
| POG | 1.54 | 90% RH moisture | [1] |
| SMAG | 6.3 | 90% RH moisture | [2] |
| PAM-CNT | 1.75 | 80% RH moisture | [3] |

## S6. Comparison of the water capacity of the hydrogels and other materials

**Table S3.** Comparison of the water capacity of sorbents in the literature.

| Materials | Water vapor capacity (g/g) at RH=90%, 25°C | Water vapor capacity (g/g) at RH=30%, 25°C | Reference |
|---|---|---|---|
| PML | 1.82 | 0.43 | **This study** |
| MOF-801 | 0.28 | 0.47 | [4] |
| MIL-101(Cr) | 1.52$^{a}$ | 0.25 | [5] |
| PNIPAM | 0.21 | 0.03 | [6] |
| PNIPAM@MIL-101(Cr) | 3.6 | 0.71 | [7] |
| PNIPAM-PPy-Cl (SMAG) | 6.5 | 0.70 | [2] |
| PAM–CNT–$CaCl_2$ | 1.75$^{b}$ | 0.68$^{c}$ | [8] |
| SHCP-10 (POPs) | 0.76 | 0.21 | [9] |
| 2D ep-POP | 0.40 | 0.1 | [10] |
| COF-432 | 0.31 | 0.025 | [11] |
| COFs-480-hydrazide | 0.47 | 0.33 | [12] |

$^{a}$: $T_{ads/des}$=30°C;

$^{b}$: RH=80%;

$^{c}$: RH=35%

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