# Supplementary Information

## Selective Sacrificial Metal-Organic Framework; Highly Quantitative Colorimetric Naked-Eye Detector for Aluminum Ion in Aqueous Solutions

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### Materials and methods

All ingredients were purchased from companies of chemicals such as Aldrich and Merck and used without further purification. Melting point measurement of the ligands were performed on an Electrothermal 9100 apparatus. The IR spectra (KBr tablet) have been recorded in the range of 4000-400 $cm^{-1}$ by Nicolet Fourier Transform IR, Nicolet 100 spectrometer. Thermogravimetric analysis (TGA) of the structure was recorded by computer-controlled PL-STA 1500 apparatus from 25 to 600 $^{o}C$ with the gradient of 10 $^{o}C$/min under neutral $N_2$ atmosphere into alumina pans. The crystallographic measurements of TMU-60 was performed by the Bruker APEX area-detector diffractometer. Collection of the intensity data were done using graphite monochromated Mo–Kα radiation (λ=0.71073 Å) at 298 K. The X- XRD measurements were done by a Philips X'pert diffractometer with monochromated Cu-kα radiation (λ=1.54056A). The adsorption/desorption isotherm of nitrogen gas was measured at liquid $N_2$ temperature (77 K) using a Micromeritics ASAP 2020 analyzer. The specific surface area was calculated by the Brunauer-Emmett-Teller (BET) method.

**Table S.1.** Crystal data and structure refinements of TMU-60.

| **Identification code** | **TMU-60** |
|---|---|
| Chemical formula | $C_{21}$ $H_{15}$ $N_2$ $O_5$ Zn |
| computing_structure_refinement | SHELXL-2016/6 |
| Chemical formula weight | 420.38 |
| T(K) | 293.2 |
| Crystal syst | Orthorhombic |
| Space group | $I_{bca}$ |
| a (°A) | 17.6350(15) |
| b (°A) | 22.345(2) |
| c (°A) | 22.944(2) |
| α (deg) | 90 |
| β (deg) | 90 |
| γ (deg) | 90 |
| V (Å$^3$) | 9041.18 |
| Z | 16 |
| F(000) | 3600 |
| R(int) | 0.0448 |
| Goodness-of-fit on $F^2$ | 1.103 |
| wR factor | 0.1080 |
| CCDC number | 1862166 |

**Table S.2**. Selected bond lengths (Å) and angles (º) for TMU-60.

| Bond | | Angle | |
|---|---|---|---|
| $Zn_1$-$O_3$ | 2.046(2) | $C_{17}$-$C_{19}$-$C_{20}$ | 122.34 |
| $Zn_1$-$N_1$ | 2.026(2) | $C_{19}$-$C_{20}$-$C_{20}$ | 124.80 |
| $C_{20}$-$C_{20}$ | 1.371(3) | $C_{20}$-$C_{20}$-$N_2$ | 120.65 |
| $C_{20}$-$N_2$ | 1.391(3) | $C_{20}$-$N_2$-$C_{21}$ | 116.34 |
| $C_{21}$-$N_2$ | 1.438(4) | $N_2$-$C_{21}$-$C_{21}$ | 110.70 |
| $C_{21}$-$C_{21}$ | 1.496(8) | $C_7$-$O_5$-$C_8$ | 118.50 |
| $N_2$-$H_2$ | 0.820(3) | $C_6$-$C_7$-$0O_5$ | 122.95 |


**Figure S.1.** Steps of convert L to L* in the presence of NaCN and heat in DMF.

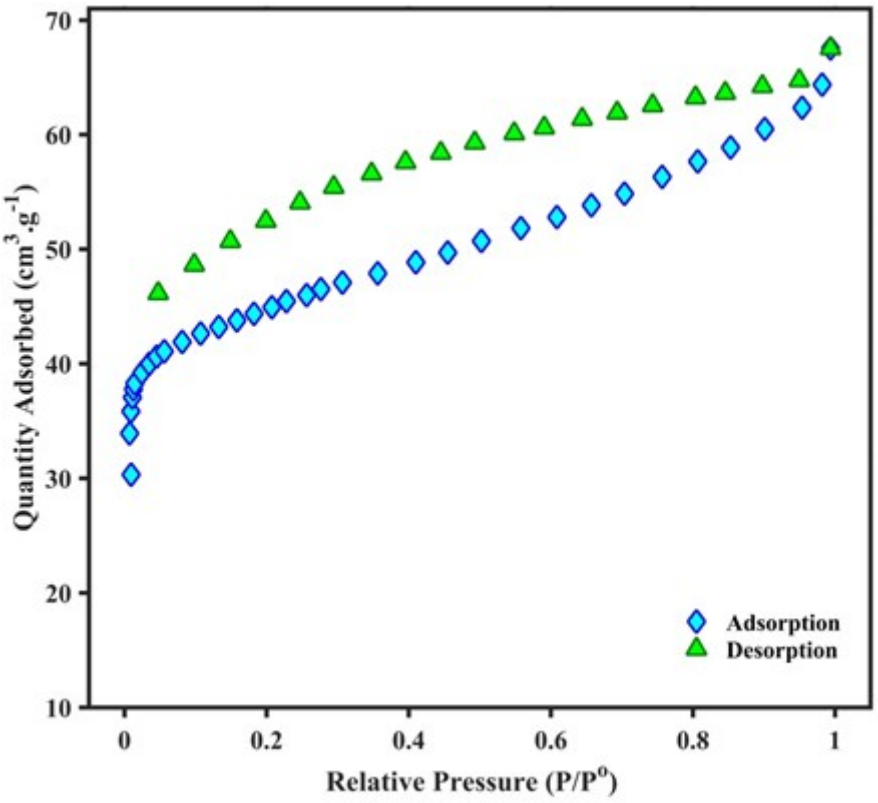


**Figure S.2.** $N_2$ adsorption-desorption isotherms of TMU-60 after activation.

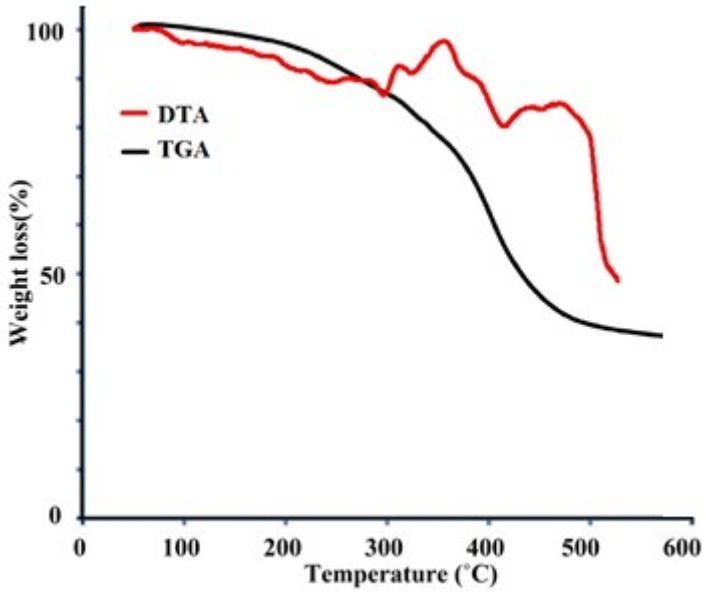


**Figure S.3.** The TGA and DTA curves of TMU-60.

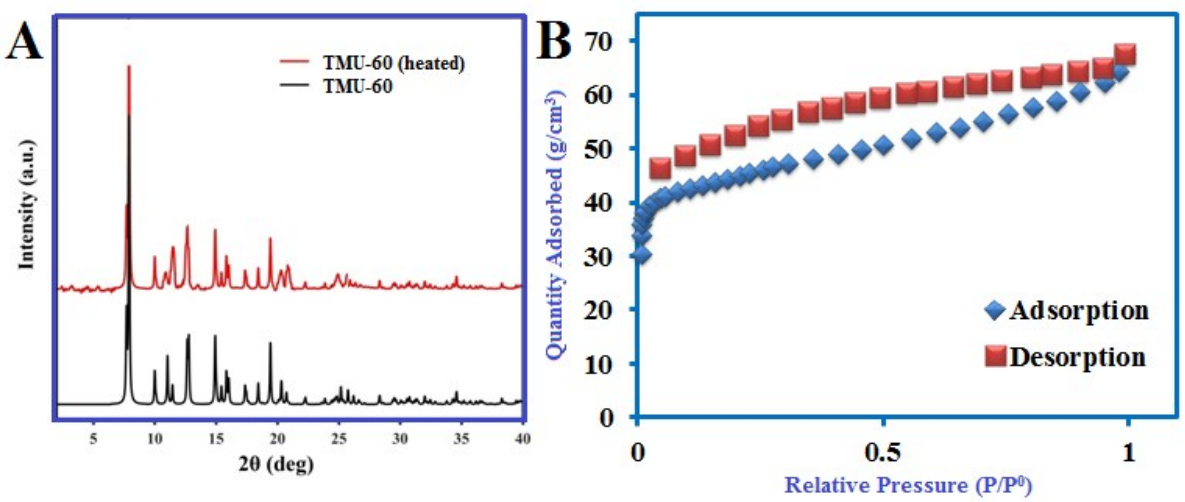


**Figure S.4**. The XRD pattern and BET of TMU-60 placed at 250˚C for 12 hours.

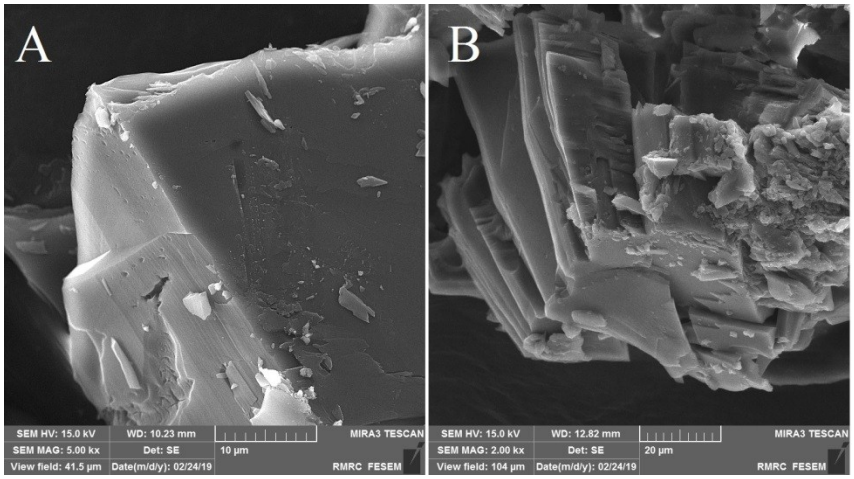


**Figure S5**. SEM images of TMU-60 power before (A) and after (B) of immersion in Al(III) aqueous solution.

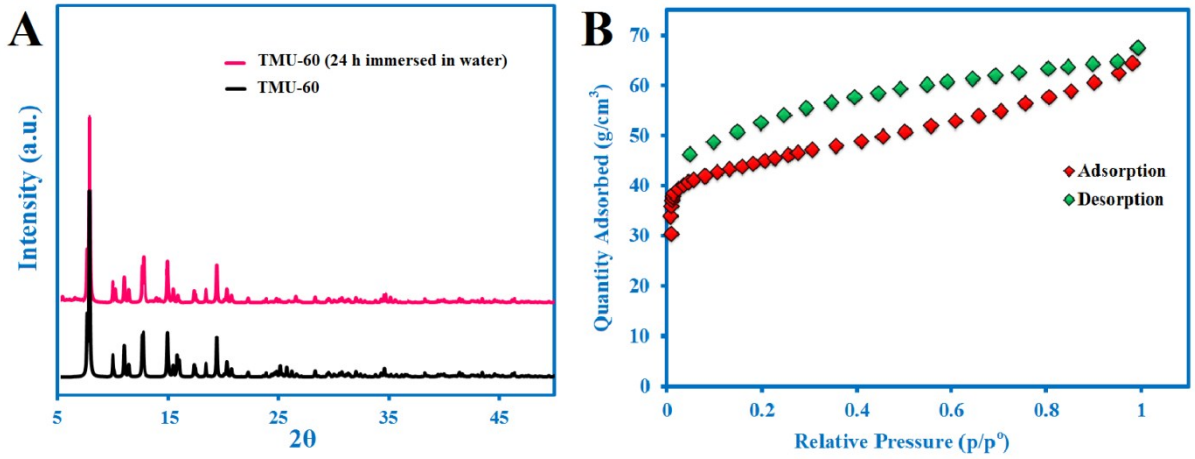


**Figure S.6**. The XRD pattern and BET of TMU-60 after 24 h immersion in water.

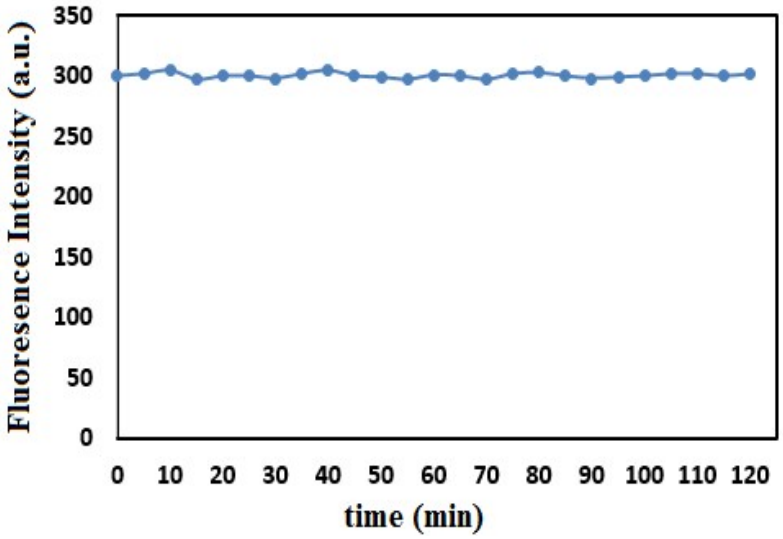


**Figure S.7**. Photostability of TMU-60 after 2 hours irradiation with 330 nm light for with 5 min duration for each time.

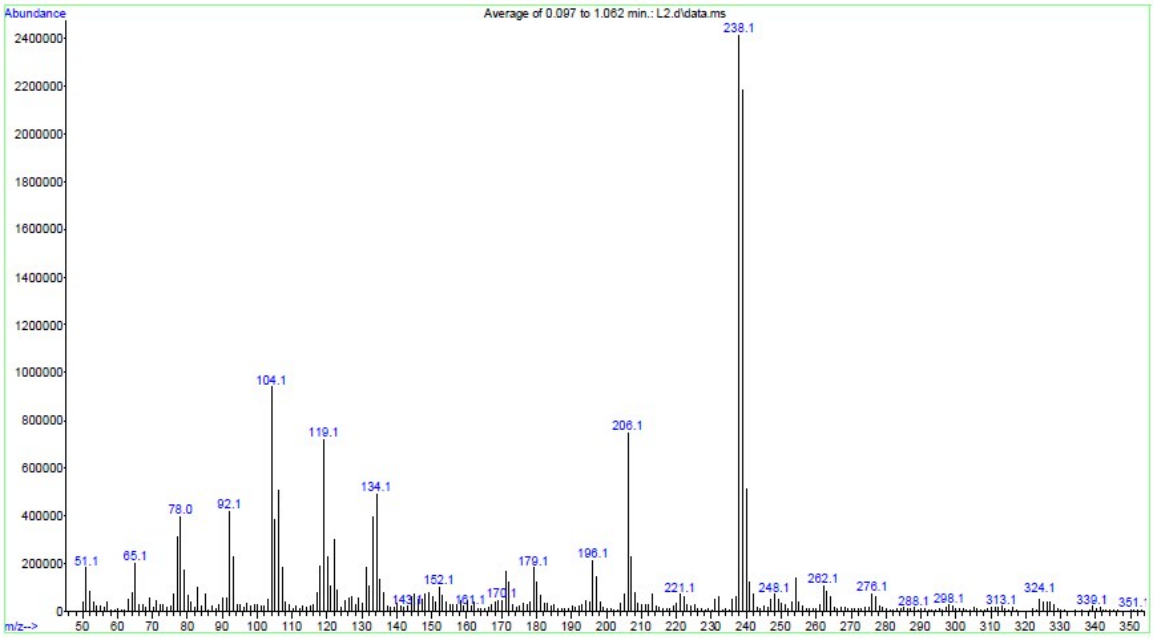


**Fig S.8**. The Mass Spectrum of $L^*$.

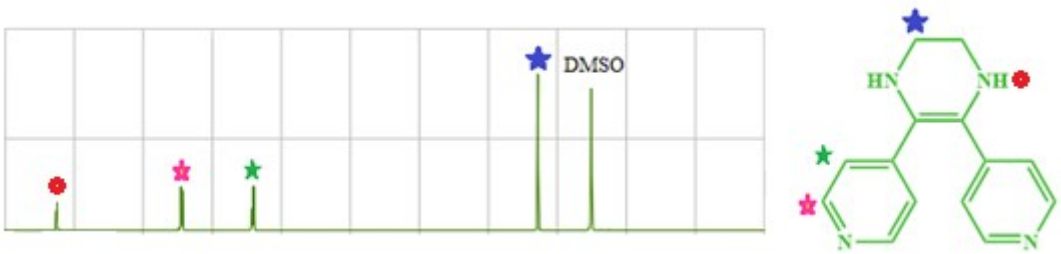


**Fig S.9**. $^1$H NMR spectrum of $L^*$ in DMSO as solvent.