Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting Information

A Low-cost, Swift Response, Highly Sensitive MOF-based Dual Sensing Device Enables Detection of Ultralow Humidity Levels and Solvent Polarity Changes

T. Leelasree,[a] P. N. Sidhartha,[b] Manav Tathacharya,[b] Karumbaiah N. Chappanda,[b,c] Himanshu Aggarwal*[a,d]

a. Department of Chemistry, Birla Institute of Technology and Science, Hyderabad Campus, Hyderabad 500078, India.

E-mail: himanshu.aggarwal@hyderabad.bits-pilani.ac.in

b. Department of Electronics and Electrical Engineering, Birla Institute of Technology and Science, Hyderabad Campus, Hyderabad 500078, India.

c. Sensors and Nano Electronics (SANE) Lab, School of Applied Engineering and Technology, Southern Illinois University Carbondale, Illinois - 62901, USA.

d. Materials Center for Sustainable Energy & Environment (McSEE), Birla Institute of Technology and Science, Hyderabad Campus, Hyderabad 500078, India.

Table of contents

Supplementary Figures……………………………………………………………….. 3-7

Fig. S1 Energy-dispersive x-ray spectroscopy (EDS) spectrum of [Eu(BTC)]- MOF.

Fig. S2 Elemental mapping of [Eu(BTC)]- MOF depicting the presence of Eu, C, and O elements.

Fig. S3 X-ray photoelectron spectroscopy **(**XPS) survey spectra (a), Eu 3d spectrum (b), C 1s spectrum (c), and O 1s spectrum (d) of [Eu(BTC)]- MOF.

Fig. S4 Thermo gravimetric analysis (TGA) of as-synthesized and activated crystals of [Eu(BTC)]- MOF.

Fig. S5 Powder x-ray diffraction **(**PXRD) analysis of as-synthesized with simulated patterns, water exchanged and activated crystals of [Eu(BTC)]- MOF.

Fig. S6 Capacitance response of the sensor towards polar protic solvents- ethanol and methanol.

Fig. S7 Capacitance response of the sensor towards polar aprotic solvents- acetonitrile and acetone.

Fig. S8 Capacitance response of the sensor towards non-polar solvents- toluene and hexane.

Supplementary Tables………………………………………………………………........ 8

Table S1. EDS analysis of [Eu(BTC)]- MOF showing the atomic and weight % of the elements present in the MOF system.

Table S2. Relative solvent polarity index of the solvents analyzed for the study.

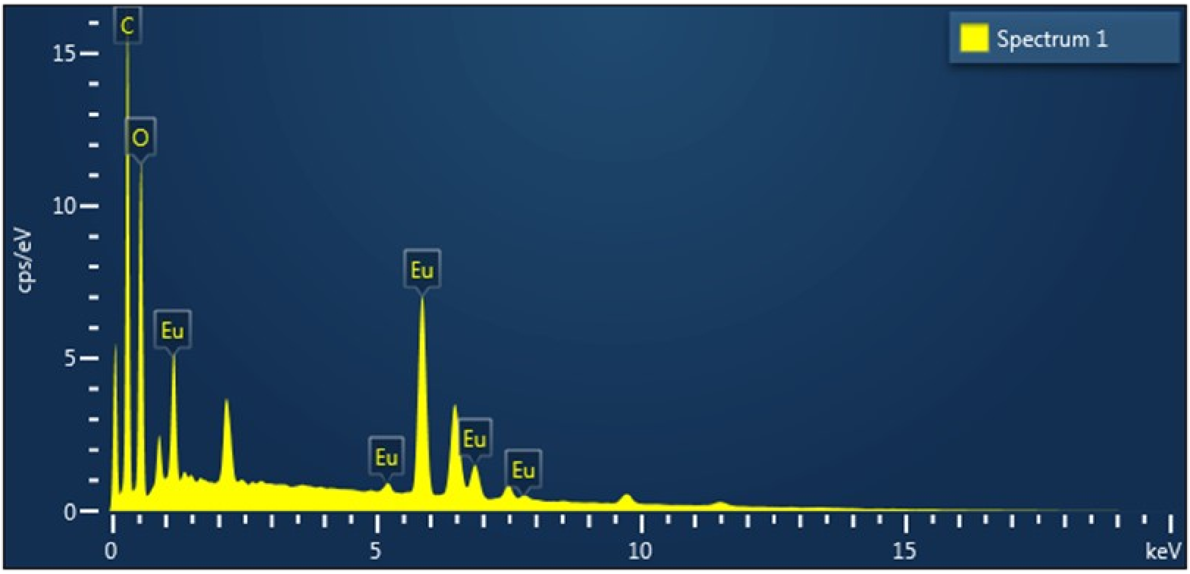

Fig. S1 Energy-dispersive Xray spectroscopy (EDS) spectrum of [Eu(BTC)]- MOF.

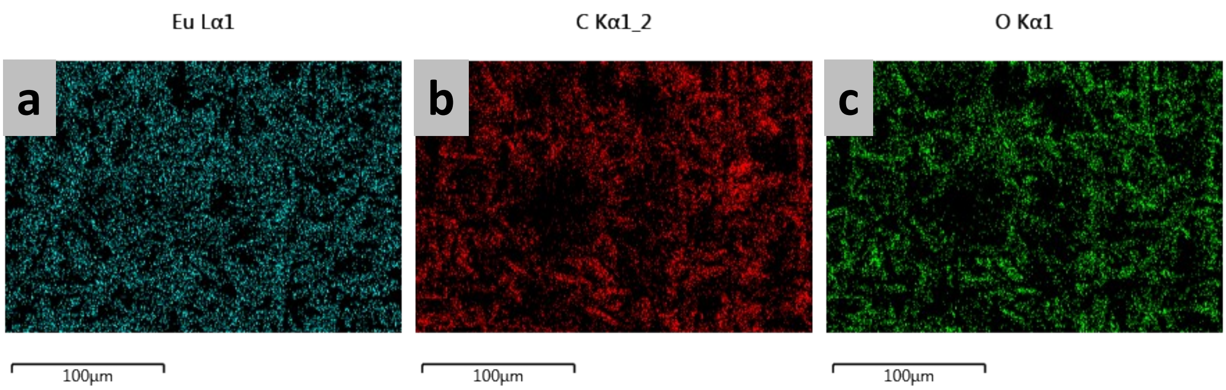

Fig. S2 Elemental mapping of [Eu(BTC)]- MOF depicting the presence of (a) Eu, (b) C, and (c) O elements.

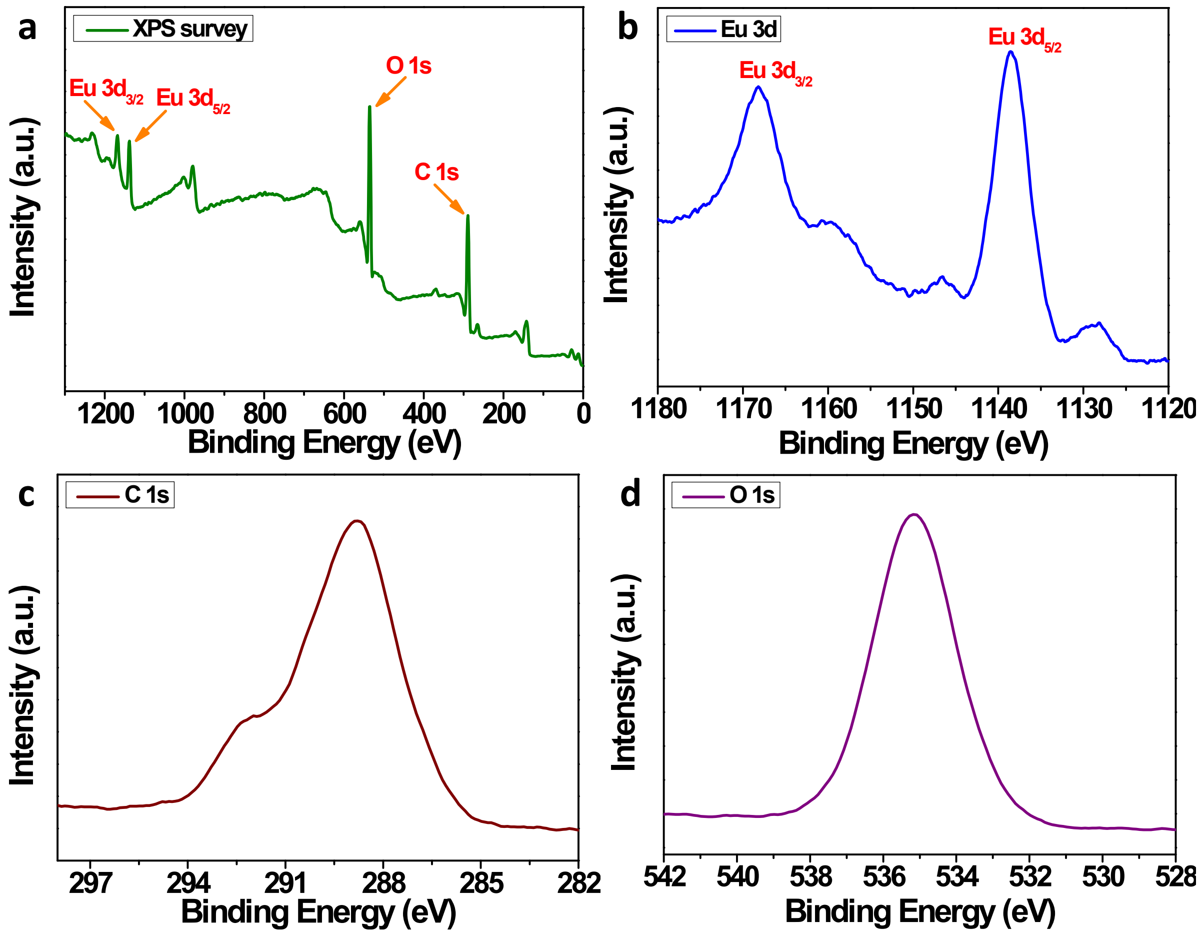

Fig. S3 X-ray photoelectron spectroscopy (XPS) analysis of of [Eu(BTC)]- MOF depicting (a) XPS survey spectra, (b) Eu 3d spectrum, (c) C 1s spectrum, and (d) O 1s spectrum.

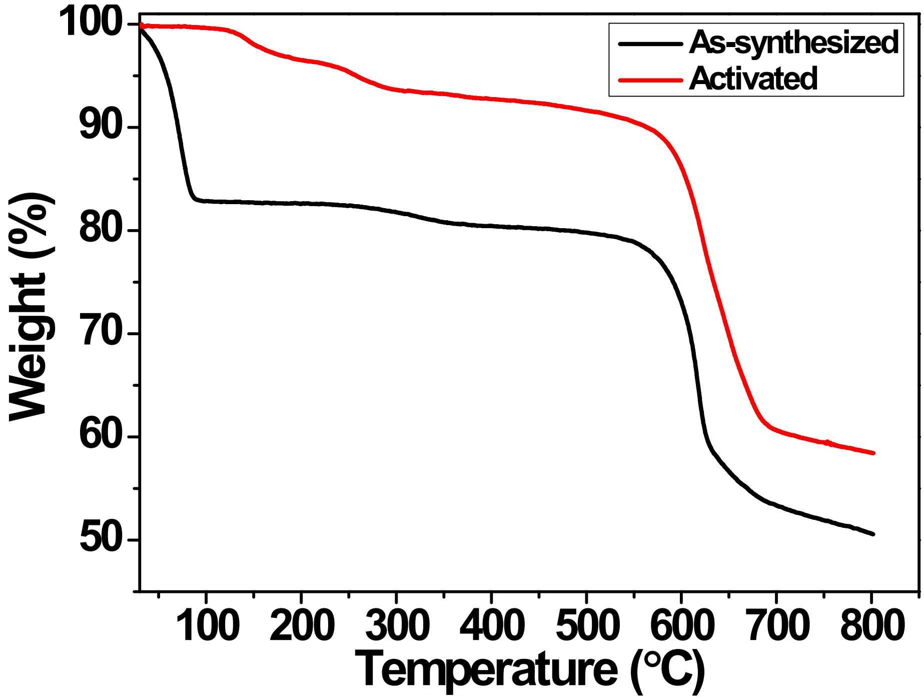

Fig. S4 Thermogravimetric (TGA) curve of as-synthesized and activated crystals of [Eu(BTC)]- MOF.

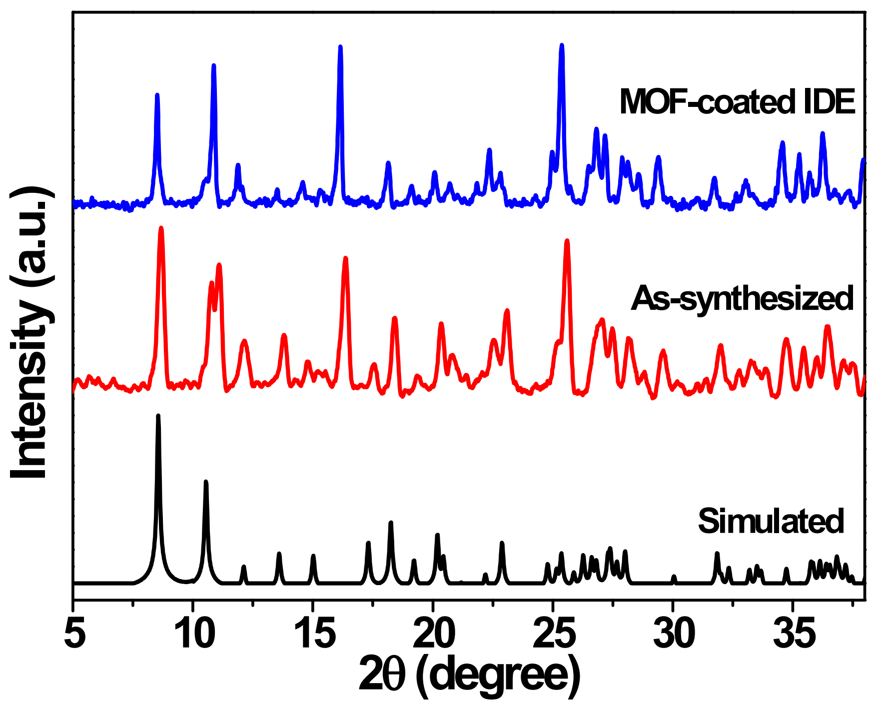

Fig. S5 Powder x-ray diffraction (PXRD) analysis of MOF drop-casted on IDE (blue) compared with as-synthesized (red) and simulated (black) patterns of [Eu(BTC)]- MOF.

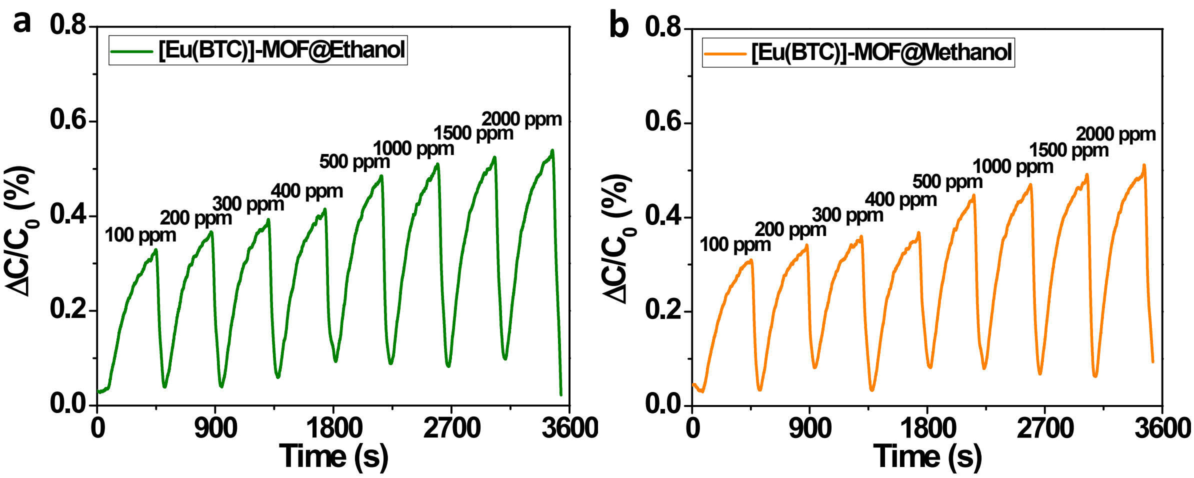

Fig. S6 Capacitance response of the sensor towards polar protic solvents- ethanol and methanol.

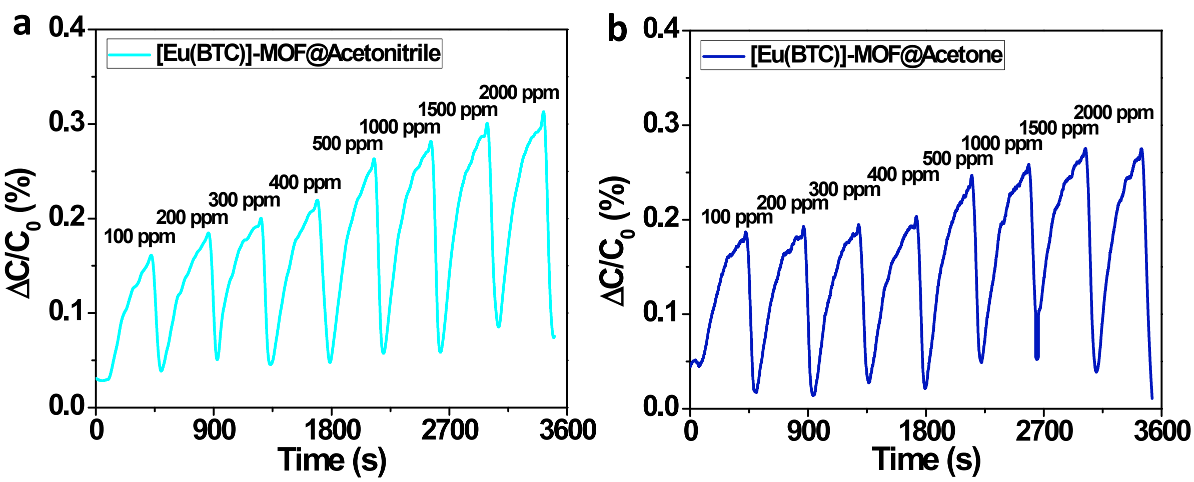

Fig. S7 Capacitance response of the sensor towards polar aprotic solvents- acetonitrile and acetone.

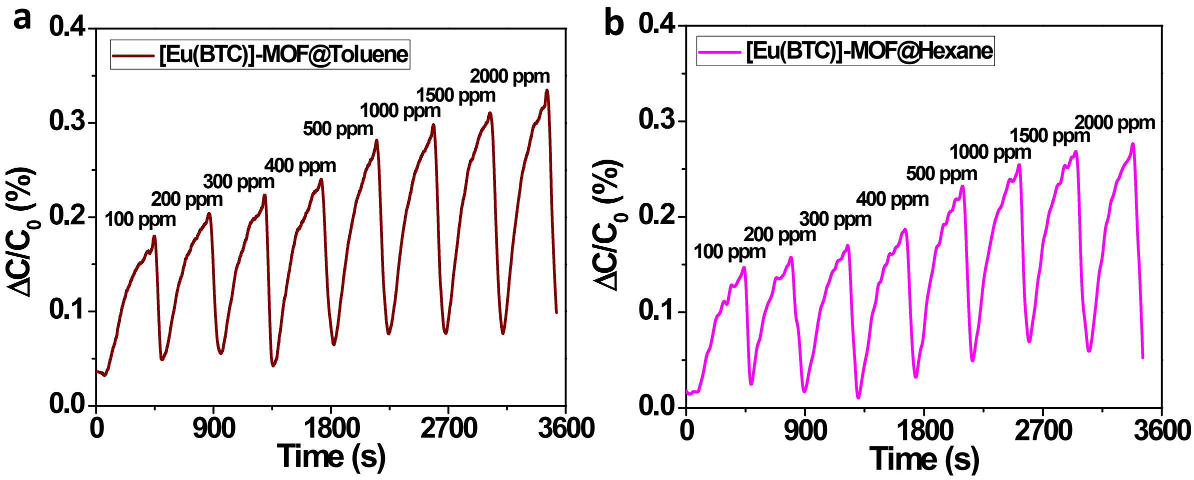

Fig. S8 Capacitance response of the sensor towards non-polar solvents- toluene and hexane.

Supplementary Tables

Table S1. EDS analysis of [Eu(BTC)]- MOF showing the atomic and weight % of the elements present in the MOF system.

Element	**Weight (%)**	**Atomic (%)**
Europium (Eu)	**42**	**6**
Carbon (C)	**32**	**58**
Oxygen (O)	**26**	**36**
Total	**100**	**100**

Table S2. Relative solvent polarity index of the solvents analyzed for the study.

Solvent	**Relative solvent index**
Water	1
Methanol	0.76
Ethanol	0.65
Acetonitrile	0.46
Acetone	0.35
Toluene	0.099
Hexane	0.009