

## Electronic Supplementary Information (ESI) for:

### Facile fabrication of metal-organic framework HKUST-1-based rewritable data storage devices

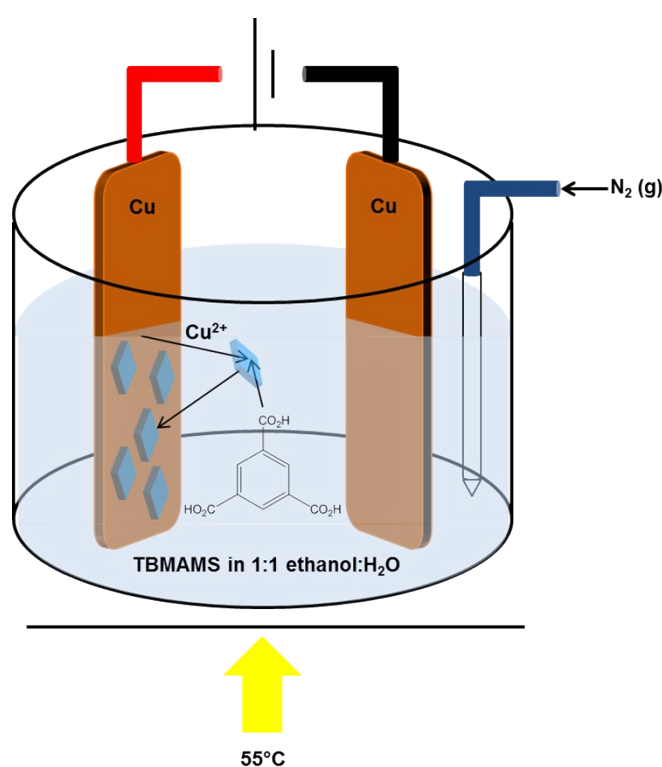
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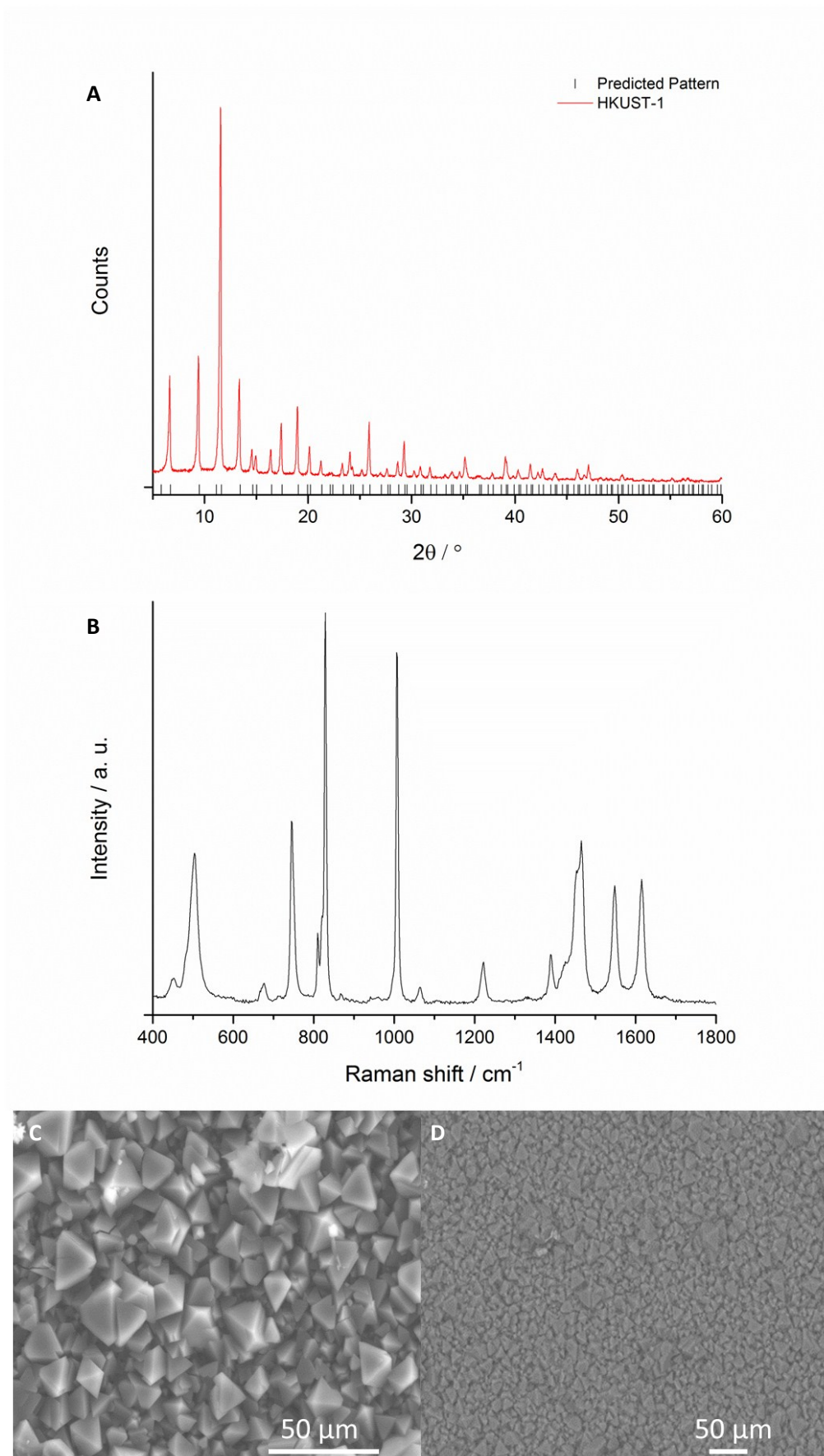
<sup>b</sup> School of Chemistry, University of Manchester, Oxford Road, Manchester, M13 9PL

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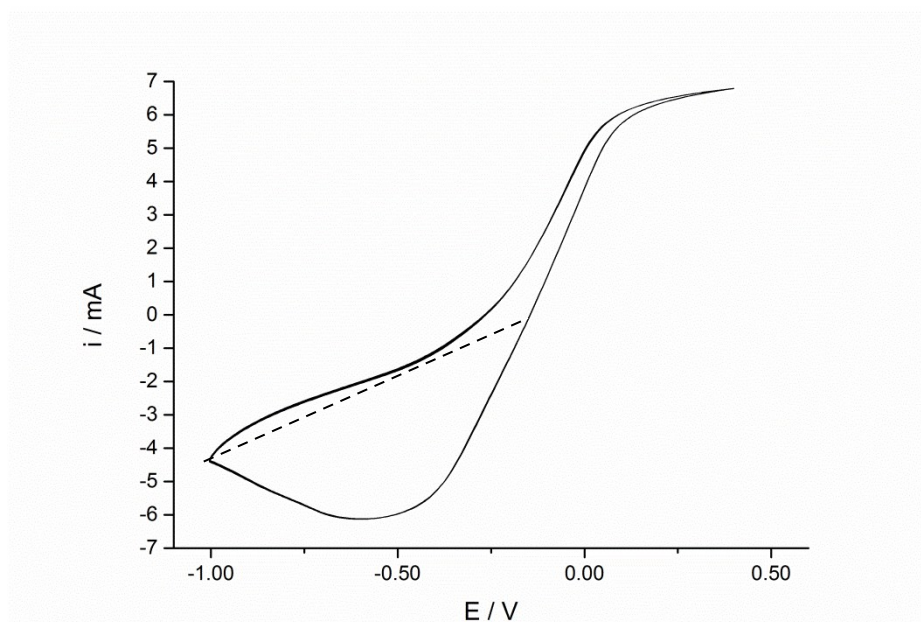
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**Figure S1** Illustration of the experimental setup used to synthesise the HKUST-1 coatings



**Figure S2** PXRD pattern of the HKUST-1 coating compared to the predicted peak positions <sup>1</sup> (A), Raman spectrum of the HKUST-1 coating (B) and SEM images taken using secondary electron detection (C) and backscattered electron detection (D) of the HKUST-1 crystal coating on the Cu electrode surface.



**Figure S3** 3 electrode cyclic voltammograms (HKUST-1 coated Cu working electrode, carbon rod counter electrode and Ag wire quasi reference electrode) obtained in saturated  $\text{Na}_2\text{SO}_4$  in 1:1 ethanol: $\text{H}_2\text{O}$  at  $0.07 \text{ V s}^{-1}$ . Peak area =  $0.00225 \text{ W}$

$$P = 0.00225 \text{ W}$$

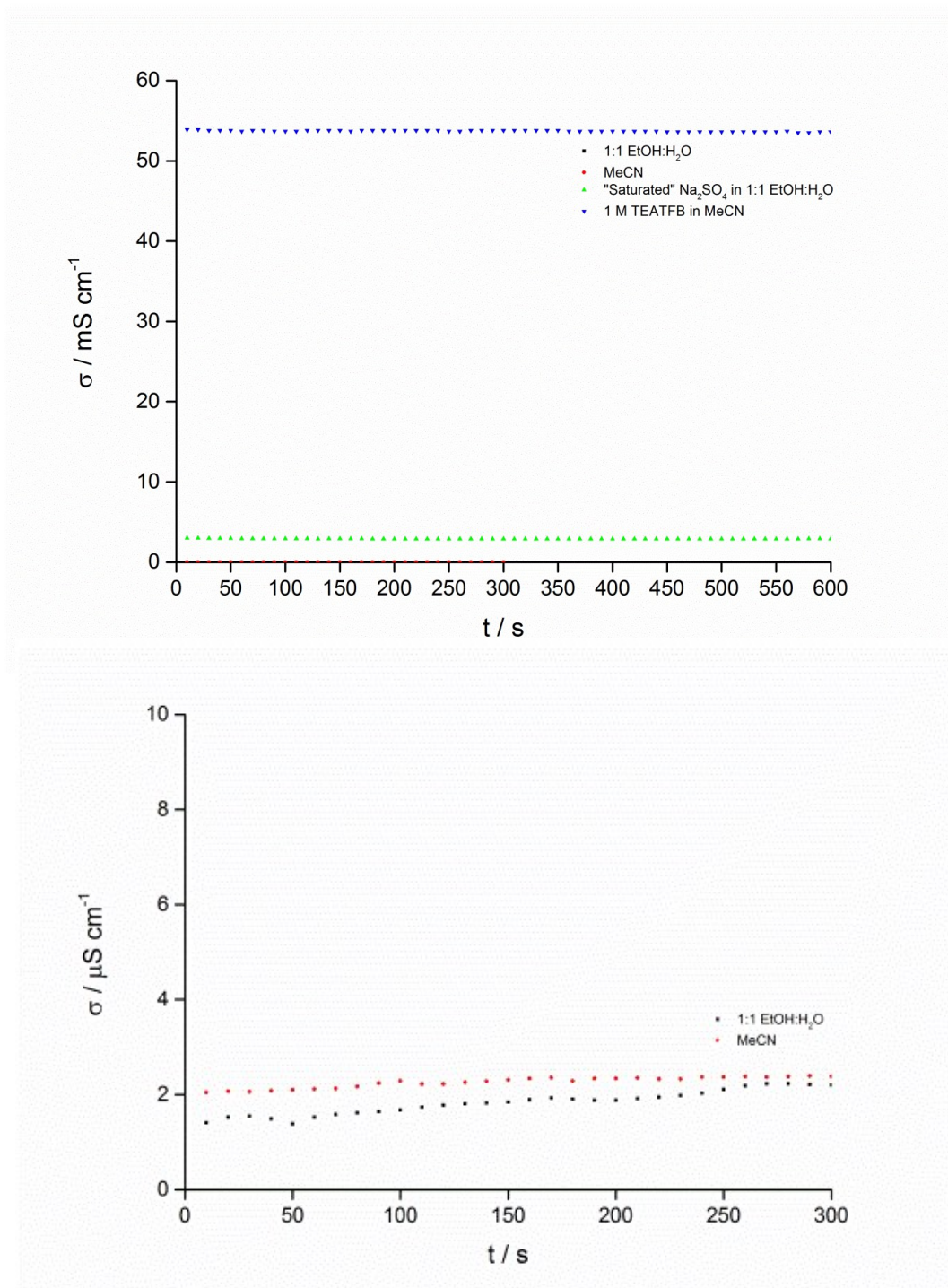
$$Q = \frac{P}{\nu E} = \frac{0.00225 \text{ W}}{0.07 \text{ V s}^{-1} \times 0.858 \text{ V}} = 0.0375 \text{ C}$$

$$n_{\text{electrons}} = \frac{Q}{e} = \frac{0.0375 \text{ C}}{1.60 \times 10^{-19} \text{ C}} = 2.34 \times 10^{17}$$

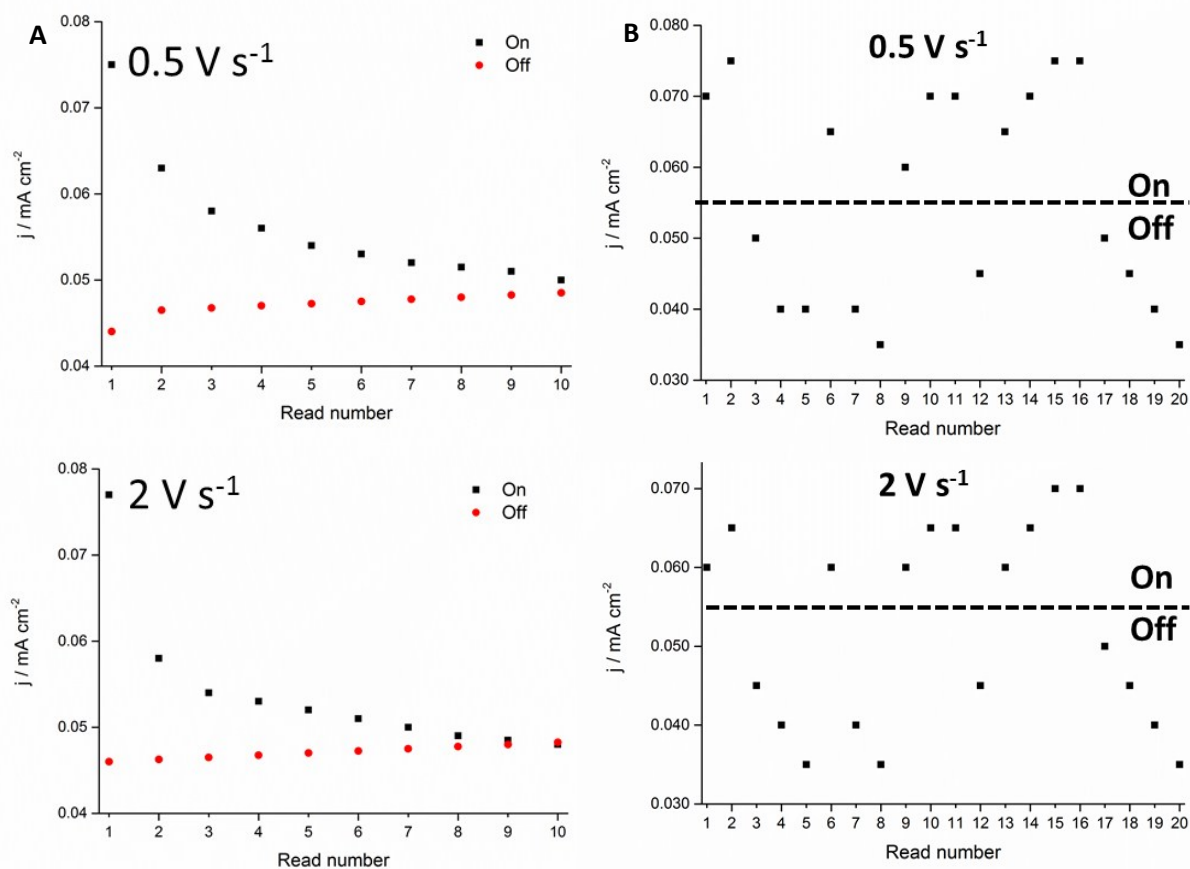
$$n_{\text{Cu ions}} = n_{\text{electrons}} = 2.34 \times 10^{17}$$

$$M_{\text{Cu ions}} = \frac{n_{\text{Cu ions}}}{N_A} = \frac{2.34 \times 10^{17}}{6.02 \times 10^{23}} = 3.88 \times 10^{-7} \text{ mol}$$

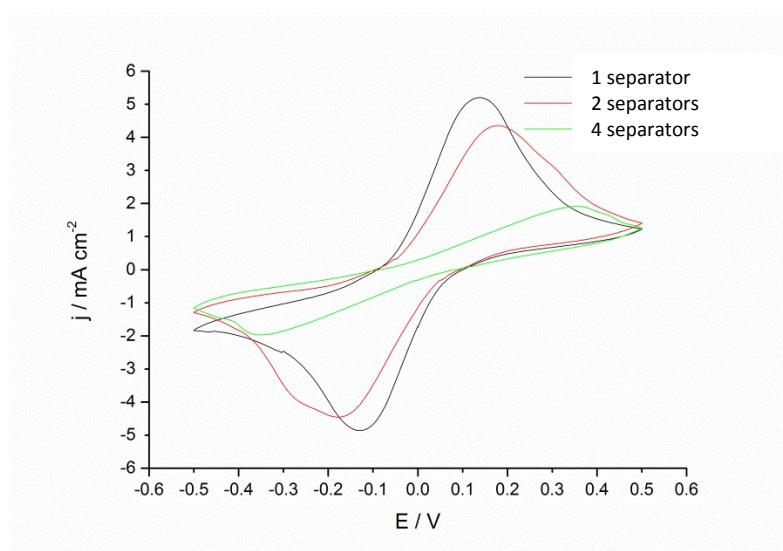
Calculation of redox conversion, where  $P$  is power,  $Q$  corresponds to charge,  $\nu$  represents voltage scan rate,  $E$  to potential,  $e$  is the elementary charge,  $M$  is number of moles,  $m$  is mass and  $N_A$  is the Avagadro number.



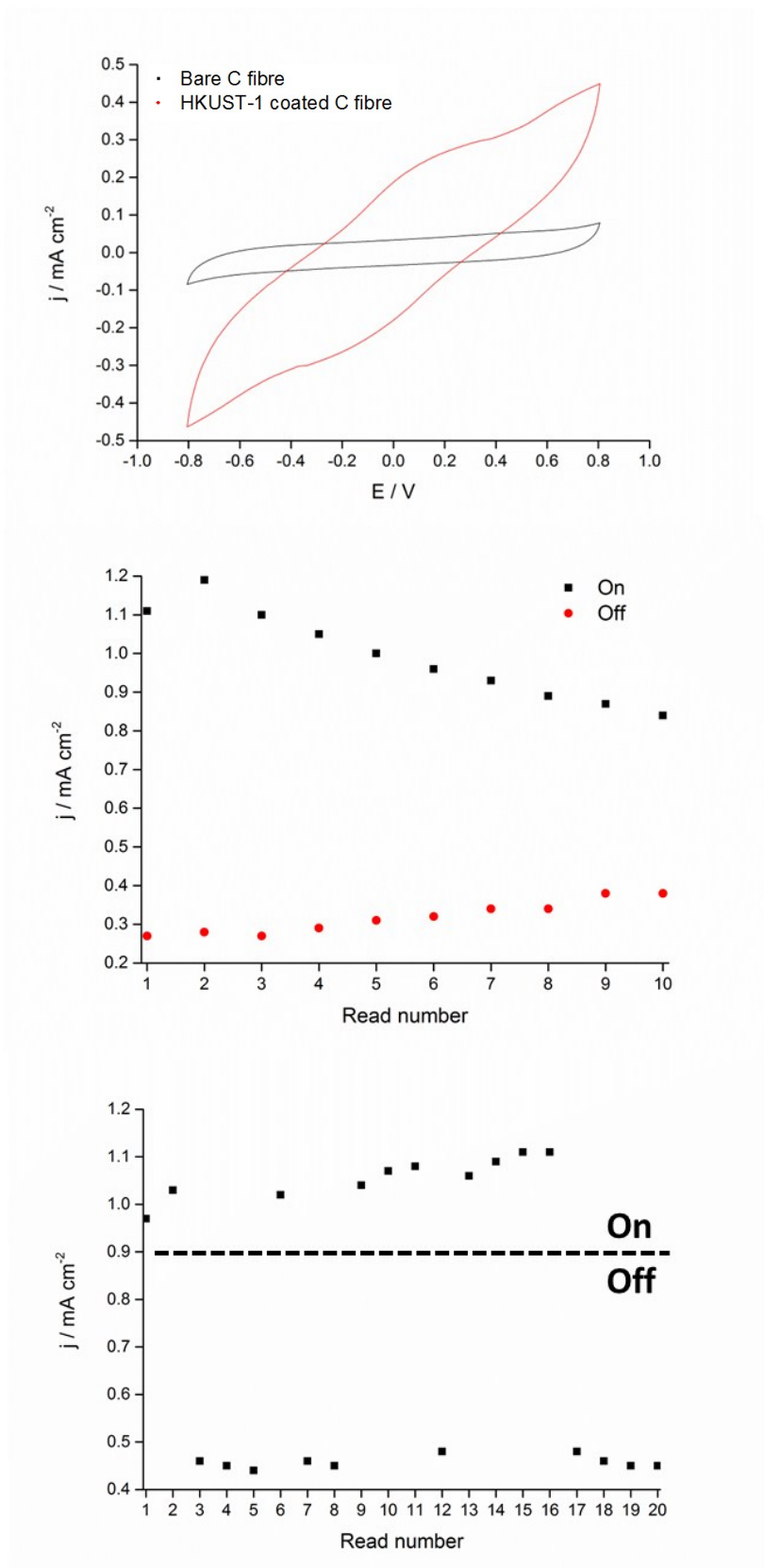
**Figure S4** Conductivity of the two different electrolytes and the relevant solvents as a function of a time (top) and a magnification of just the relevant solvents (bottom).



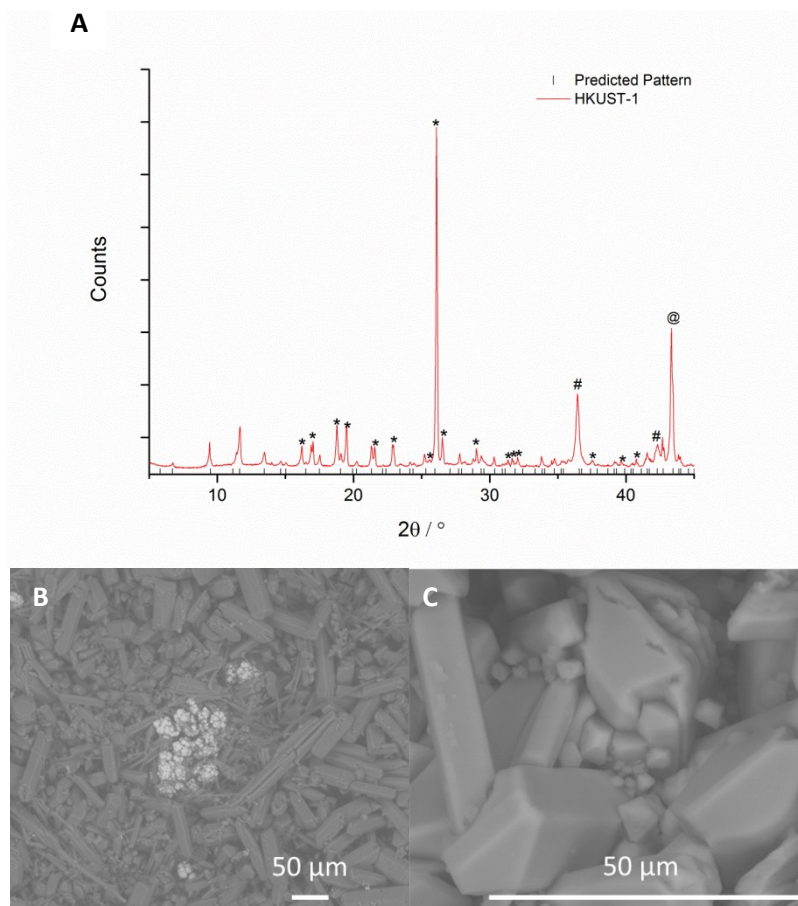
**Figure S5** Stability of “on” and “off” states to successive reading (A) and rewritability of arbitrarily chosen “on” and “off” states (B) written at different scan rates using the processes outlined in Figure 5. Current densities ( $j$ ) obtained from chronoamperometry in saturated  $\text{Na}_2\text{SO}_4$  in 1:1 ethanol:  $\text{H}_2\text{O}$ .



**Figure S6** Cyclic voltammograms from coin cells utilising various numbers of separators, obtained in 1M TEATFB in acetonitrile at  $0.07 \text{ V s}^{-1}$



**Figure S7** Comparison of the cyclic voltammograms obtained in saturated Na<sub>2</sub>SO<sub>4</sub> in 1:1 ethanol:H<sub>2</sub>O when using HKUST-1 coated C cloth electrodes (red) as opposed to bare C cloth electrodes (black) (top). Stability (middle) and rewritability (bottom) of “on” and “off” states, written at 0.07 V s<sup>-1</sup> in a coin cell using the processes outlined in Figure 5. Current densities  $j$  obtained from chronoamperometry in saturated Na<sub>2</sub>SO<sub>4</sub> in 1:1 ethanol:H<sub>2</sub>O.



**Figure S8** PXRD pattern of the HKUST-1 coating compared to the predicted peak positions <sup>1</sup> after 6000 cycles (A) and SEM images taken using backscattered electron detection (B and C) of the HKUST-1 crystal coating on the Cu electrode surface after 6000 cycles. Peaks labelled \* are from a different crystalline phase of Cu<sup>2+</sup> and BTC <sup>2</sup>, peaks labelled with # are from copper oxide <sup>3</sup> and peaks labelled with @ are from Cu<sup>4</sup>. Data above 45 2θ° omitted for clarity in order to exclude large Cu peak.

1. S. S. Y. Chui, S. M. F. Lo, J. P. H. Charmant, A. G. Orpen and I. D. Williams, *Science*, 1999, **283**, 1148-1150.
2. R. Pech and J. Pickardt, *Acta Crystallographica Section C*, 1988, **44**, 992-994.
3. S. L. Cheng and M. F. Chen, *Nanoscale research letters*, 2012, **7**.
4. T. Theivasanthi and M. Alagar, *Archives of Physics Research*, 2010, **1**, 112 - 117.