

*Electronic Supplementary Information*

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***In-situ* grown Synergistic Co-based metal-organic framework/graphene oxide composite  
for enhanced supercapacitor performance**

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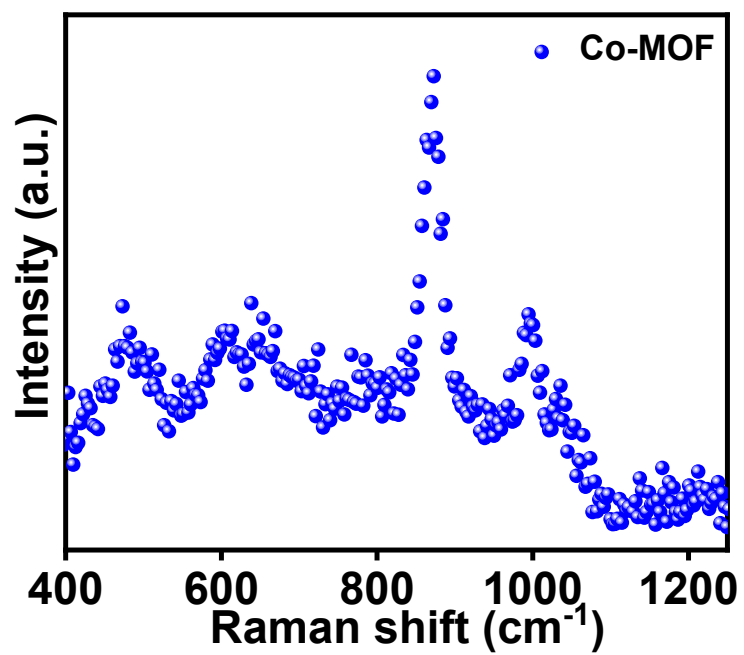


Fig. S1. Raman spectra of Co-MOF.

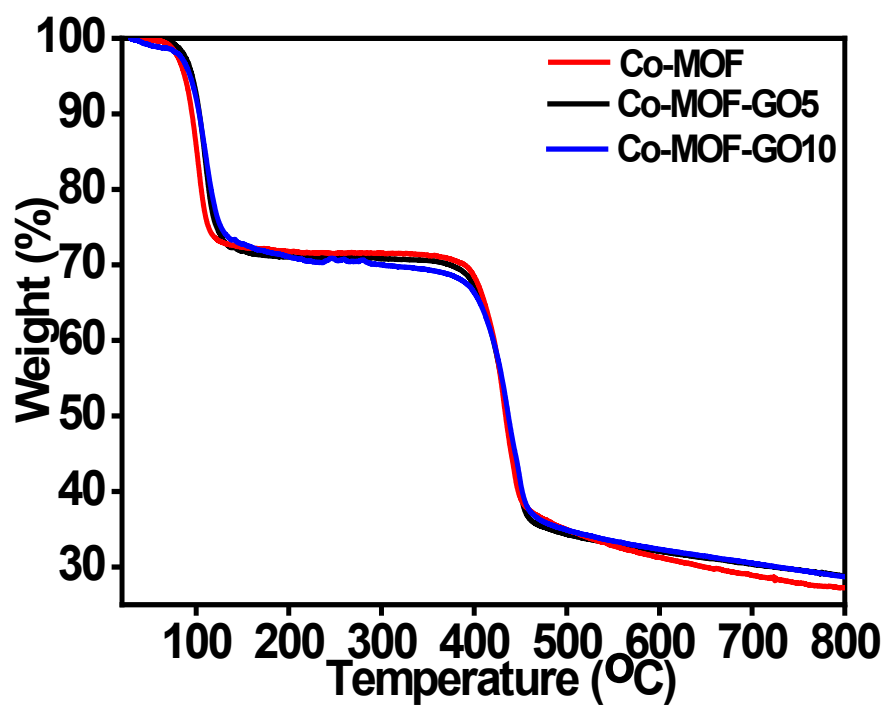
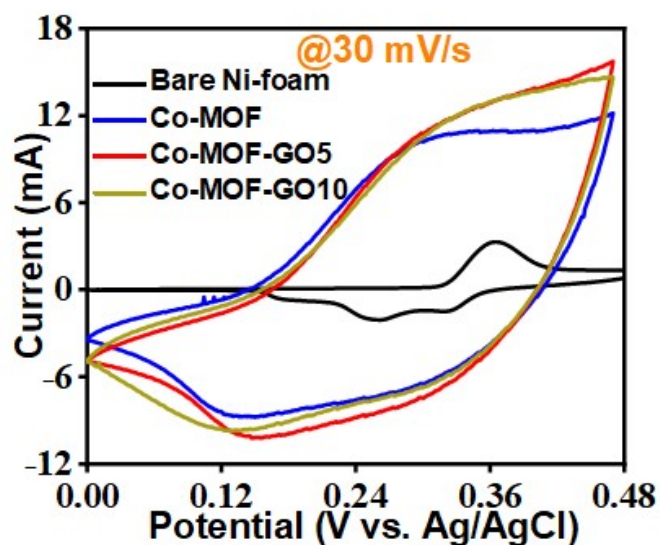
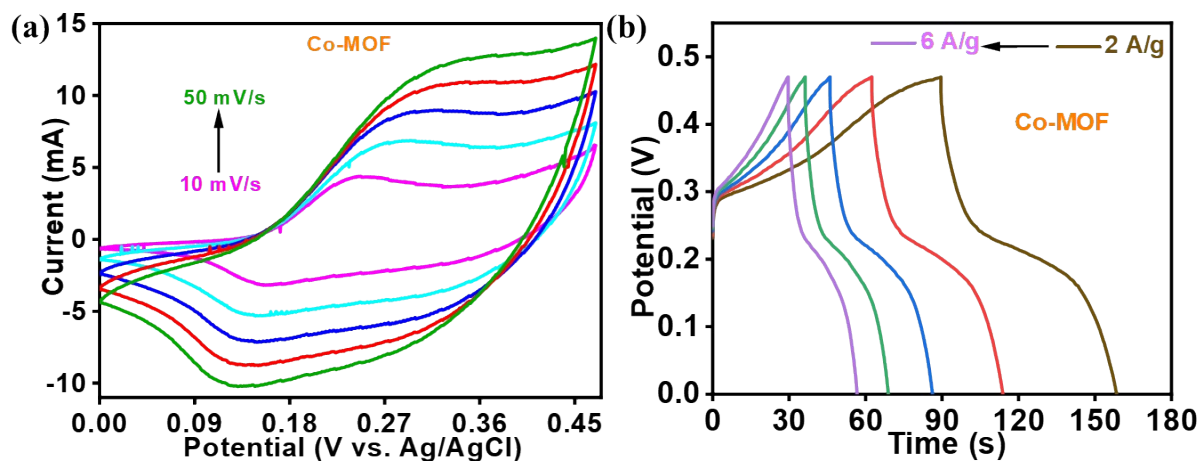


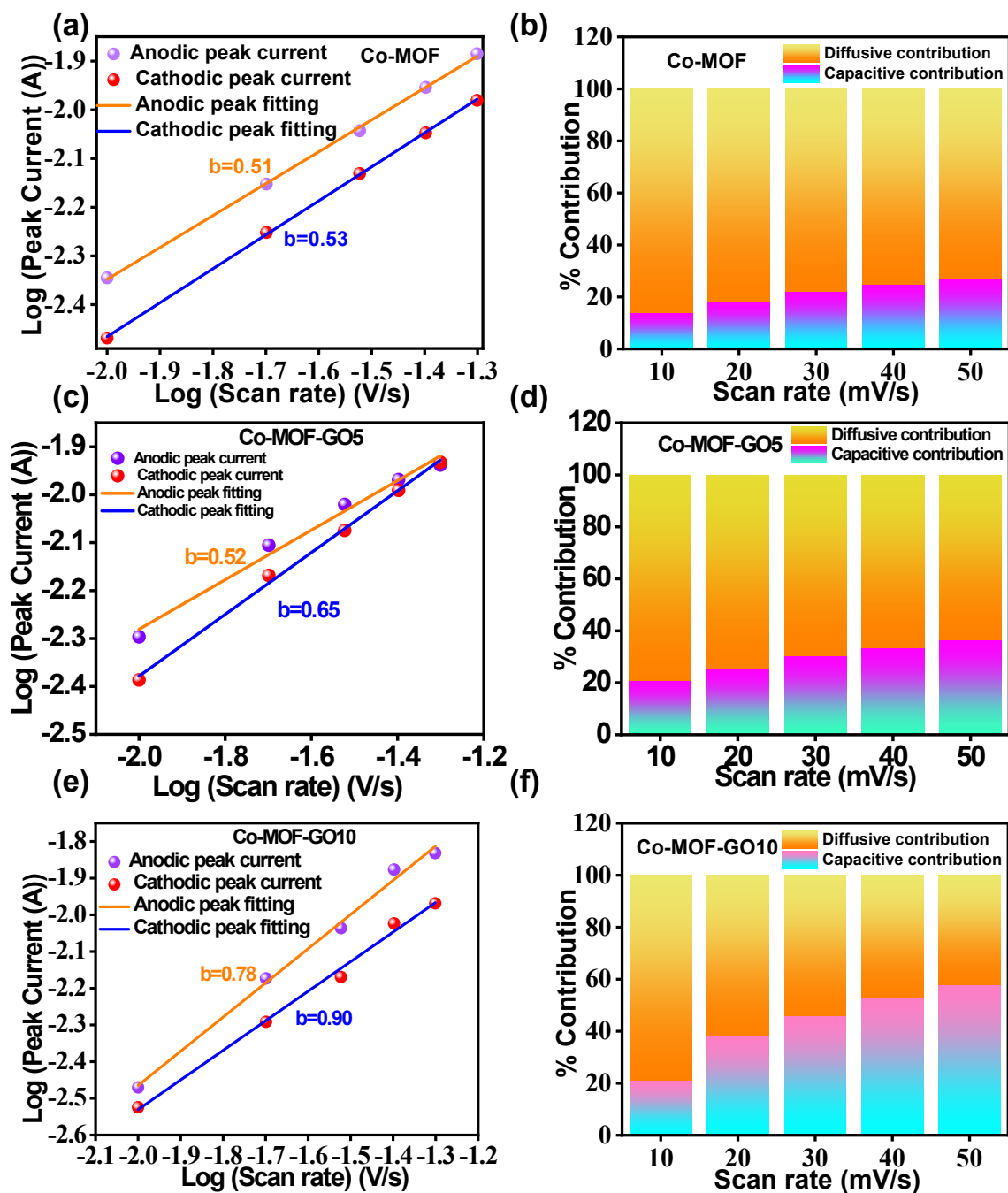
Fig. S2. Thermo-gravimetric (TG) analysis of as-synthesized Co-MOF, Co-MOF-GO-5, and Co-MOF-GO-10.



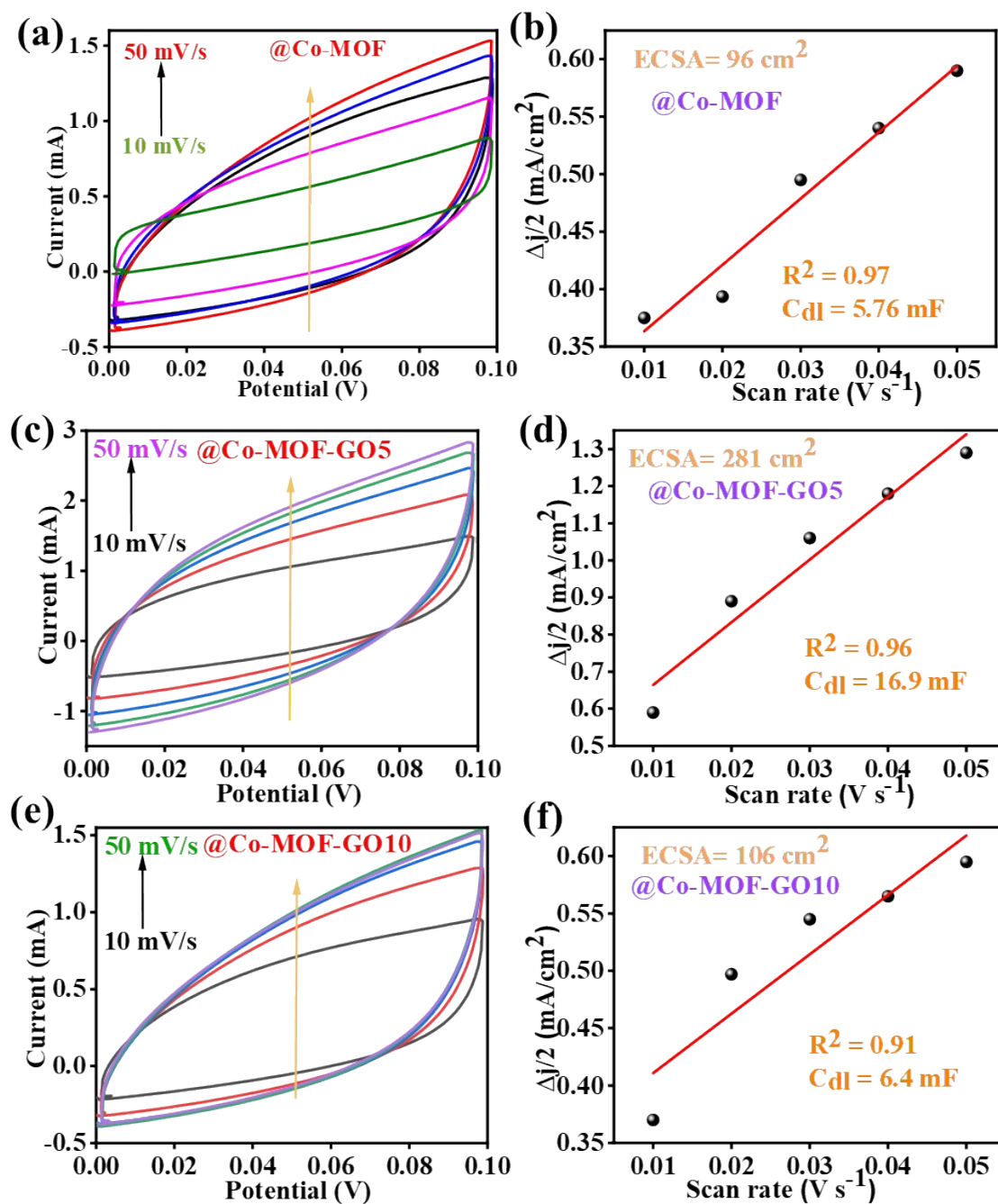
**Fig. S3.** Comparison of CV profile for bare Ni-foam, Co-MOF, Co-MOF-GO5, and Co-MOF-GO10 at  $30 \text{ mV s}^{-1}$ ; (b) GCD profile at various current densities for bare Ni-foam.



**Fig. S4.** (a) CV profile at different scan rates for Co-MOF at 10 to  $50 \text{ mV s}^{-1}$ ; (b) GCD profile at various current densities for Co-MOF.



**Fig. S5.** Mechanistic insights into charge storage for Co-MOF-GO, Co-MOF-GO5 and Co-MOF-GO10. Calculation of  $b$  values from the anodic and cathodic peak-fitting plot and diffusive-capacitive contribution plot, (a-b) for Co-MOF; (c-d) for Co-MOF-GO5; and (e-f) for Co-MOF-GO10, respectively.



**Fig. S6.** (a, c, e) Cyclic voltammograms of Co-MOF, Co-MOF-GO5, and Co-MOF-GO10, respectively, at various scan rates measured in the non-Faradic region; (b, d, f) Corresponding plots for calculating the C<sub>dl</sub> and ECSA of Co-MOF, Co-MOF-GO5, and Co-MOF-GO10, respectively.

**Table S1:** Comparison of supercapacitive properties of Co-MOF-GO5 with recently reported MOFs and MOF-graphene composites

Materials	Potential window (V)	Electrolyte	Specific Capacitance (F g <sup>-1</sup> )	Current Density (A g <sup>-1</sup> )	Ref.
<b>MOF as electrode material</b>					
Cd-MOF	-0.8 to 0.4 V	1 M NaOH/KOH/LiOH	647	4	<i>Inorg. Chem.</i> , 2023, <b>62</b> , 3084-3094
Co(II)-TMU-63	0-0.5	2 M KOH	384	6	<i>Inorg. Chem.</i> , 2019, <b>58</b> , 16100-16111
Zn-CP	0-0.55		377	1	<i>Dalton Trans.</i> , 2023, <b>52</b> , 5943-5955
NH <sub>2</sub> -TMU-53	0-0.4	6 M KOH	325	5	<i>ACS Appl. Mater. Interfaces.</i> , 2019, <b>11</b> , 14759-14773
Co(II)-TMU-63#CoMn <sub>2</sub> O <sub>4</sub> NCPs	0-0.5	2 M KOH	1240	7	<i>J. Mater. Chem. A.</i> , 2021, <b>9</b> , 11001-11012
Co-MOF	0-0.35	6 M KOH	425	2	<i>Dalton Trans.</i> , 2023, <b>52</b> , 14663-14675.
<b>MOF@graphene</b>					
Mo-MeIm derived MoO <sub>3</sub> /RGO	0 - 0.8	PVA-H <sub>2</sub> SO <sub>4</sub>	617	1	<i>Adv. Mater.</i> , 2015, <b>27</b> , 4695-4701.
Cu-MOF@rGO	-1-0.2	1 M Na <sub>2</sub> SO <sub>4</sub>	375	2	<i>Inorg. Chem.</i> , 2019, <b>58</b> , 9844-9854.
Cu-MOF/rGO (SD)	-0.5-0.7	1 M Na <sub>2</sub> SO <sub>4</sub>	685.33	1.6	<i>J. Mater. Chem. A.</i> , 2016, <b>4</b> , 16432-16445.
rGO/HKUST-1	-0.1-1	0.5 M Na <sub>2</sub> SO <sub>4</sub>	385	1	<i>Electrochimica Acta</i> , 2015, <b>157</b> , 69-77.
Co-MOF-RGO	0 - 0.6	6 M KOH	430	1	<i>Electrochimica Acta</i> , 2018, <b>275</b> , 76-86.
Mn BTC derived Mn <sub>3</sub> O <sub>4</sub> /Graphene	-0.1 - 0.9	1 M Na <sub>2</sub> SO <sub>4</sub>	456	1	<i>J. Mater. Sci.</i> , 2017, <b>52</b> , 446-457
UIO-66/RGO	--	6 M KOH	302	0.15	<i>Coord. Chem. Rev.</i> , 2018, <b>369</b> , 15-38.
ZIF-67 derived LDH/GO Films	--	6 M KOH	273	1	<i>Coord. Chem. Rev.</i> , 2018, <b>369</b> , 15-38.
copper-1H-imidazole@activated carbon	0-0.8	1 M KOH	221	2	<i>New J. Chem.</i> , 2018, <b>42</b> , 10300-10308.
Ce-MOF/GO	-0.2-0.4	3 M KOH	233.8	1	<i>RSC Adv.</i> , 2018, <b>8</b> , 3462-3469.
Ni-Co-MOF/GO	-0.2 - 0.35	6 M KOH	447.2	1	<i>Electrochimica Acta</i> , 2019, <b>311</b> , 62-71
nanocomposite CoSNC ((PPF-3) MOF)	0-0.6	2 M KOH	360.1	1.5	<i>J. Am. Chem. Soc.</i> , 2016, <b>138</b> , 6924-6927
ADC-C/rGO	0-0.5	2 M KOH	308	2	<i>ACS Appl. Energy Mater.</i> , 2019, <b>2</b> , 5029-5038.

<b>Co-MO-GO5</b>	<b>0-0.47</b>	<b>1 M KOH</b>	<b>552</b>	<b>2</b>	<b>This Work</b>
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