Supporting Information

Elemental Pegging Effect in Locally Ordered Nanocrystallites of High-Entropy Oxide Enables Superior Lithium Storage

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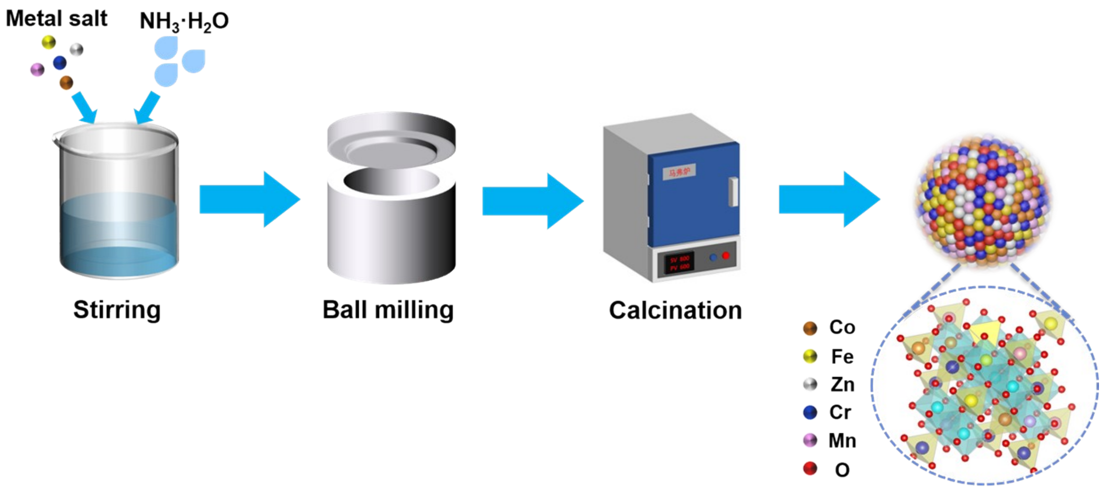

Scheme S1. Schematic diagram of the synthesis process of the HEO-MFCCZ

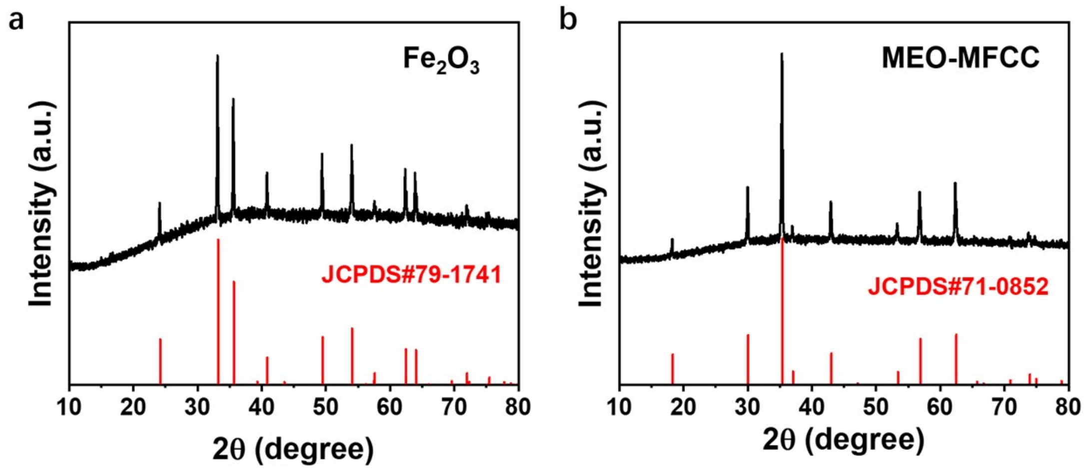

Fig. S1. XRD patterns of Fe_2O_3 and HEO-MFCC.

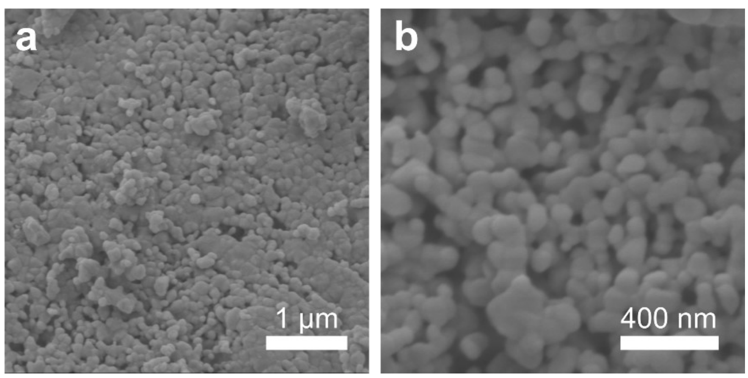

Fig. S2. SEM images of Fe_2O_3.

Table S1. ICP data for the HEO-MFCCZ and MEO-MFCC with the percentage of each element.

	Mn	**Fe**	**Co**	**Cr**	**Zn**	S_{config}
HEO-MFCCZ	23.4%	23%	21.6%	19.2%	12.8%	1.58R
MEO-MFCC	27.5%	30.2%	23.5%	18.8%	--	1.37R

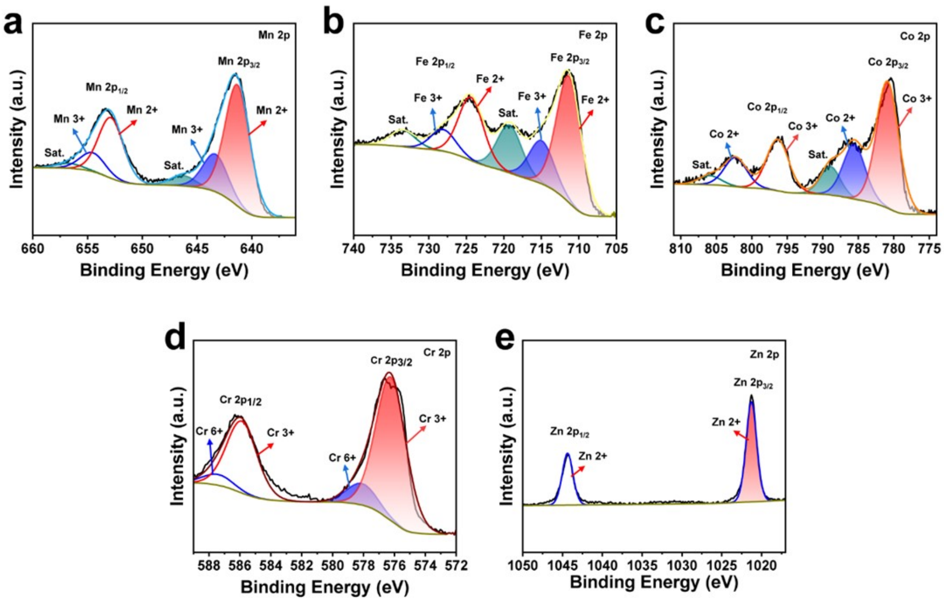

Fig. S3. XPS of different elements in the HEO-MFCCZ: (a) Mn; (b) Fe; (c) Co; (d) Cr; (e) Zn.

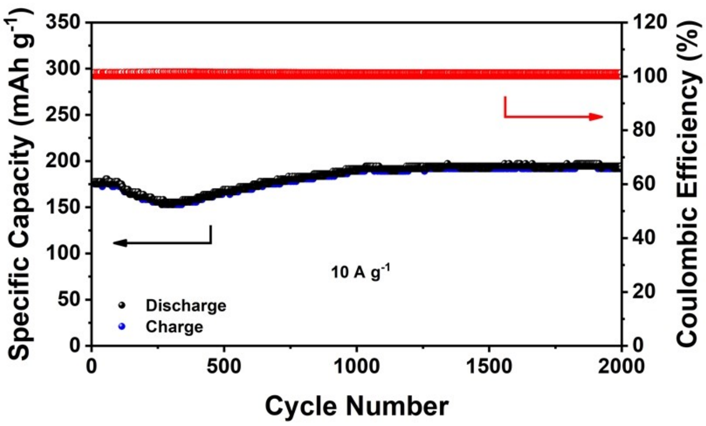

Fig. S4. Cyclic test of the HEO-MFCCZ electrode at a current density of 10 A g^{-1}

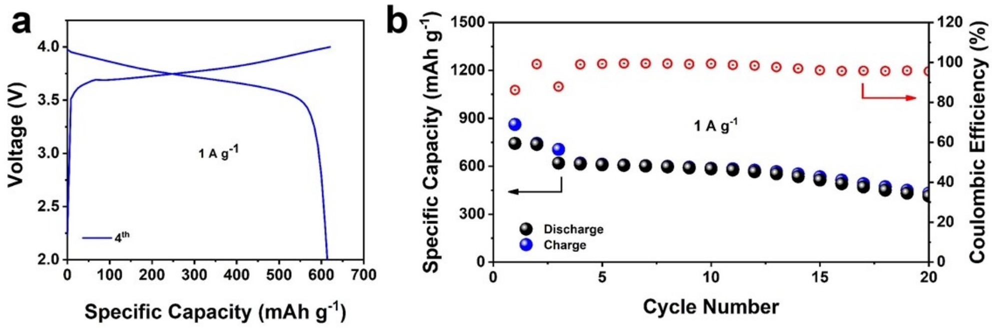

Fig. S5. Cyclic test of full battery at a current density of 1 A g^{-1}

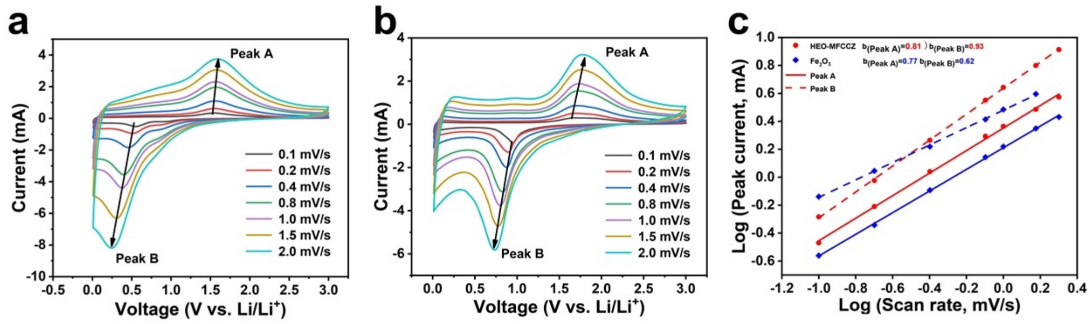

Fig. S6. CV curves at different scan rates: (a) HEO-MFCCZ ; (b) Fe_2O_3; (c) The comparison of b values of two materials.

Table S2. Comparison of the main parameters of the HEO-MFCCZ in this work with other HEO-related working symmetric cells.

Composition	Crystal Structure	Rate capacity	Cycle performance (cycles)	Electrolyte	Ref
(MgCoNiCuZn)O	Rock salt	180 mAh g^{-1} at 3 A g-1	590 mAh g^{-1} at 0.2 A g^{-1} (300)	1 M LiPF6 in EC:EMC = 1:1 (vol)	[1]
$(MgCoNiZn)_{0.65}Li_{0.35}O$	Rock salt	680 mAh g^{-1} at 1 A g^{-1}	610 mAh g^{-1} at 1 A g^{-1} (100)	1 M LiPF6 in EC:DMC = 1:1 (vol)	[2]
$(Mg_{0.2}Co_{0.2}Ni_{0.}2Cu_{0.2}Zn_{0.2})O$	Rock salt	206 mAh g^{-1} at 2 A g^{-1}	390 mAh g^{-1} at 500 mA g^{-1} (300)	1 M $LiPF_6$ in EC:DEC:DMC = 1:1:1 (vol)	[3]
(LiMgCoNiCuZn)O	Rock salt	455 mAh g^{-1} at 2 A g^{-1}	417 mAh g^{-1} at 1 A g^{-1} (300)	1 M $LiPF_6$ in EC:DMC:EMC	[4]

				= 1:1:1 (vol)	
$(FeNiCrMnZn)_3O_4$	Spinel	382 mAh g^{-1} at 1 A g^{-1}	387 mAh g^{-1} at 500 mA g^{-1} (185)	1M LiPF6 in EC:DEC=1:1 (vol)	[5]
$(FeCoNiCrMnZnLi)_3O_4$	Spine	250 mAsh g-1 at 1 A g-1	522 mAh g^{-1} at 500 mA g^{-1} (100)	1 M LiPF6 in EC:DEC:EMC = 1:1:1 (vol)	[6]
$(FeCoNiCrMn)_3O_4$	Spinel	423 mAh g^{-1} at 1 A g^{-1}	220 mAh g^{-1} at 5 A g^{-1} (5000)	1 M LiPF6 in EC:PC = 1:1 (vol)	[7]
$(CrNiMnFeCu)_3O_4$	Spinel	480 mAh g^{-1} at 2 A g^{-1}	600 mAh g^{-1} at 500 mA g^{-1} (500)	1M LiPF6 in EC:DEC=1:1 (vol) with 5%FEC	[8]
$(Mn_{0.23}Fe_{0.23}Co_{0.22}Cr_{0.19}Zn_{0.13})_3O_4$	**Spinel**	**590 mAh g^{-1} at 2 A g^{-1} and 680 mAh g^{-1} at 1 A g^{-1}**	**620 at 2 A g^{-1} (550)**	**1M $LiPF_6$ in EC:DEC=1:1 (vol) with 5%FEC**	**This work**

Table S3. Results of XPS data with the elemental valence changes of the HEO-MFCCZ

Results of the elemental valence changes of the HEO-MFCCZ										
	Fe			**Mn**		**Co**		**Cr**		
	Fe^{0+}	Fe^{2+}	Fe^{3+}	Mn^{2+}	Mn^{3+}	Co^{2+}	Co^{3+}	Cr^{0+}	Cr^{3+}	Cr^{6+}
0.01 V	10	60	30	80	20	47	53	73	27	0
3 V	9	51	39	69	31	23	67	56	44	0

Annotation

The crystal structures in this work (**Fig. 1** and **Scheme S1**) were drawn through Vesta [9].

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