Supporting Information

Presodiation Technology: Progress, Strategy and Prospect of Sacrificial Cathode Additives in Sodium-based Energy Storage Systems

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Table. S1. Summary of properties and conditions of different Presodiation additives.

Presodiation additives	Preparation method	Theoretical capacity (mA h g^{-1})	Decomposition voltage (V vs. Na/Na^+)	Adding amount (wt%)	Full-cell composition	Property	Date of publication	Refs.
NaN_3	Commercial material	412	3.55	5	$HC//Na_{0.67}[Fe_{0.5}Mn_{0.5}]O_2$	Irreversible capacity from 59 to 27 mA h g^{-1}	2013.10	1
Na_2NiO_2	Stoichiometric ratios of Na_2O and NiO were mixed in a glove box and then sintered in an Ar atmosphere at 600 ℃ for 20 h	392.2	2.10-3.80	10	$Sb//NaCrO_2$	74.6 mA h g^{-1}→92.1 mA h g^{-1}	2015.09	2
Na_3P	The stoichiometric ratio of metallic sodium and red phosphorus was ball milled for 2h	804	-	10	$HC//P2\text{-}Na_{0.67}Fe_{0.5}Mn_{0.5}O_2$	71 mA h g^{-1}→155 mAh g^{-1}	2016.01	3
NaN_3	Commercial material	412	3.50	20	$HC//Na_{0.67}[Fe_{0.5}Mn_{0.5}]O_2$	50 mA h g^{-1}→130 mA h g^{-1}	2016.11	4
Na_2CO_3	Commercial material	505	4.00	30	$HC//P2\text{-}Na_xMO_2$	116 W h kg^{-1}	2017.07	5
$Na_2C_4O_4$	3, 4-dihydroxy-3-cyclobutene-1, 2-dione and Na_2CO_3 are mixed in a ratio of 1:1, dissolved in deionized water and stirred overnight	339	3.60	30	$HC//Na_3(VO)_2(PO_4)_2F$	80 mA h g^{-1}→120 mA h g^{-1}	2018.08	6
$NaNO_2$	Commercial material	427	>3.30	5	$HC//NaNO_2/Na_{2/3}[Co_{0.05}Mn_{0.95}]O_2$	154 mA h g^{-1}→210 mA h g^{-1}	2019.01	7
Na_2S	Commercial material	687	<3.60	40	$Sn_4P_3//AC$	About 48 W h kg^{-1} at a specific power of 1 kW kg^{-1}	2019.06	8
$NaCrO_2$	Cr_2O_3 and Na_2CO_3 are mixed, wet ball milled in acetone for 12 h, then dried at 80°C for 8 h, the mixture is pressed and heated at 900°C in an argon atmosphere for 5 h	250	2.00-4.20	67	$HC//Na_3V_2O_2(PO_4)_2F$	122.2 W h kg^{-1}→201.5 W h kg^{-1}	2019.06	9
EDTA-4Na	Commercial material	282	3.79-4.20	10	$HC//Na_{0.67}[Al_{0.05}Mn_{0.95}]O_2$	51 mA h g^{-1}→152 mA h g^{-1}	2019.11	10
$Na_2C_6O_6$	Commercial material	250	4.50	40	NHPC-800//AC	33.5 W h kg^{-1} at power density of 100 W kg^{-1}	2020.04	11
DTPA-5Na	DTPA-5Na solution is dried at 110℃ for 2 days. After drying, the product is ground into a fine powder	266	3.61-4.40	9	$HC//Na_{0.44}MnO_2$	58 mA h g^{-1}→128 mA h g^{-1}	2020.07	12
$Na_2C_2O_4$	Commercial material	400	3.97	10	$HC//P2\text{-}Na_{2/3}Ni_{1/3}Mn_{1/3}Ti_{1/3}O_2$	129.2 W h kg^{-1}→172.6 W h kg^{-1}	2020.07	13
Na_2O_2	Commercial material	687	4.00	20	HC//NMT	134 W h kg^{-1}→175 W h kg^{-1}	2021.01	14

$NaNH_2$	Commercial material	686	3.80	25	HC//AC	a capacitance of 35 F g^{-1} from 2.2 V to 3.8 V and a value of specific energy of 35 W h kg^{-1} at 1 kW kg^{-1}	2021.02	15
$Na_2C_3O_5$	$Na_2C_3O_5·H_2O$ was heated under vacuum at 200°C for 12 h to remove water molecules	331	4.00	18	HC//P2-$Na_{0.67}Mn_{0.8}Fe_{0.1}Ti_{0.1}O_2$	129mA h g^{-1}→164 mA h g^{-1}	2021.03	16
$NaBH_4$	Commercial material	670	2.40	25	HC//AC	18 W h kg^{-1}→33 W h kg^{-1}	2021.03	17
$C_6H_5O_7Na_3$	Commercial material	312	4.00	10	HC//NVPOF/rGO	63 mA h g^{-1}→85 mA h g^{-1}	2021.03	18
Na_2O@Ru@G	-	865	2.50-4.10	37	HC//Na[$Li_{0.05}Mn_{0.50}Ni_{0.30}Cu_{0.10}Mg_{0.05}$]$O_2$	The energy density of 295 W h kg^{-1},At 0.5 C , the specific capacity of t 80 mA h g^{-1}	2021.04	19
$Na_2C_4O_4$	3, 4-dihydroxy-3-cyclobutene-1, 2-dione and sodium carbonate were stirred overnight in 80 mL DI water at room temperature in stoichiometric ratio.	339	3.60	55	Sn_4P_3//YP80F	a high specific energy of 44 W h kg^{-1} from 3.8 V to 2.0 V	2021.05	20
AC-Na	Commercial material	326	4.18	40	NHPC-800//NMT	irreversible specific capacity of 301.8 mA h g^{-1}	2021.06	21
Na_2CO_3	Commercial material	505	4.40	32	HC//AC	a superior performance of 103 W h kg^{-1}, 13 kW kg^{-1}	2021.10	22
Na_3PS_3O	mixing Na_2S and P_2S_5 (molar ratio 3:1) and then heating at 300°C for 2 h.	379	<4.00 (≈60%)	10	HC//NNZM	31.1 mA h g^{-1}→47.7 mA h g^{-1}	2022.01	23
$Na_2C_2O_4$	Commercial material	400	3.95	15	HC//AC	118.2 W h kg^{-1} at power density of 20 W kg^{-1}	2022.01	24
$Na_2C_2O_4$	Commercial material	400	4.00	50	HC//AC	91.7 Wh kg^{-1} and 13.1 kW kg^{-1}	2022.01	25
$Na_4C_6O_6$	prepared by a simple annealing technique at 400 °C in an argon atmosphere for 2 h	412	4.50	9	HC//NVPF/rGO	154.5 W h kg^{-1}→210.8 W h kg^{-1}	2022.05	26
$C_2H_2N_3Na$	Commercial material	295	3.60	10	HC//$Na_3V_2(PO_4)_3$	180 Wh kg^{-1}→196 Wh kg^{-1}	2022.11	27
NaCN	Commercial material	547	2.90	36	HC/Sn_4P_3//YP80F	154 mA h g^{-1}→210 mA h g^{-1}	2023.03	27
Na_2S	mixing Na_2SO_4 with a carbon source, heat treatment is performed under H_2/Ar airflow	687	3.20	10	HC//$Na_3V_2(PO_4)_3$	117.2 W h kg^{-1}→138.6 W h kg^{-1}	2023.07	28
$Na_2C_2O_4$	Commercial material	400	4.0	30	$MoSe_2$-NC//PC	energy densities of	2023.10	29

$Na_2C_2O_4$	Commercial material	400	4.20-4.50	5	HC//NFPP	116 and 79 Wh kg^{-1} achieved at 197 and 8318 W kg^{-1} 256 W h kg^{-1}→305 W h kg^{-1}	2024.02	30
AC-Na	Commercial material	326	3.60	10	HC//$Na_3V_2(PO_4)_3$	120 mA h g^{-1}→148 mA h g^{-1}	2024.02	31
NaDB	1, 2-dihydroxybenzene (DB) is prepared by reaction with sodium hydride (NaH) in anhydrous tetrahydrofuran (THF) solution	348	2.40-2.80	5	HC//$Na_3V_2(PO_4)_3$	117.2 mA h g^{-1}→204.7 mA h g^{-1}	2024.02	32
CNT/MnO_2/$Na_2C_2O_4$	$KMnO_4$ and hydroxylated multi-walled CNT were dispersed in DI water with 1 mL concentrated sulfuric acid.	400	3.90	10	SC//P2-$Na_{0.67}Ni_{0.33}Mn_{0.33}Ti_{0.33}O_2$	111 Wh kg^{-1}→158 Wh kg^{-1}	2024.04	33
$Na_{3.5}C_6O_6$	Using $Na_2C_6O_6$ as the precursor, $Na_2C_6O_6$ was calcined at 400° C for 2 h in an argon atmosphere	378	3.40-3.60	5	HC//P2-$Na_{0.67}Ni_{0.33}Mn_{0.33}Ti_{0.33}O_2$	68.5 mAh g^{-1}→79.6 mAh g^{-1}	2024.06	33
$Na_{0.89}Ni_{0.05}$□$_{0.06})_2O$	Ni was implanted into the Na_2O frame by high-energy ball milling	865 (Na_2O)	2.80	10	HC//NVP or HC//NNMO	75.3 mA h g^{-1}→93.3 mA h g^{-1} 62.6 mA h g^{-1}→74.7 mA h g^{-1}	2024.07	34
NCO@C@MMNKB	Commercial $Na_2C_2O_4$ was ball-milled with sucrose for 20 h, and then sintered in a tube furnace at 410 ℃ for 5 h, and finally compounded with prepared MMNKB by ball-milling for 10 h obtain NCO@C@MMNKB	400	3.91	10	HC//$Na_{0.67}Ni_{0.33}Mn_{0.33}Ti_{0.33}O_2$	135.0 W h kg^{-1}→236.4 W h kg^{-1}	2024.11	35
$C_4H_5NNa_2O_4$ (DI-270)	Commercial DI is heat treated at 270 °C in argon atmosphere.	303	3.82	10	HC//P2-$Na_{0.67}Ni_{0.33}Mn_{0.33}Ti_{0.33}O_2$	96.3 mAh g^{-1}→189.4 mAh g^{-1}	2025.01	36
$Na_2C_3O_5$	The $Na_2C_3O_5·H_2O$ was directly mixed with conductive carbon and then dehydrated.	331	4.30	40	HC//AC	the lost only about 4% of the initial capacity after 1000 cycles	2025.02	37
Na_2S-NPS-C	Na_2S, Na_3PS_4 (NPS) and acetylene Black (AB) were ball milled after being mixed in a certain proportion.	575	1.80	3	Sn//$NaCrO_2$	90.8 mAh g^{-1}→118.2 mAh g^{-1}	2025.02	38

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