# SUPPLEMENTARY INFORMATION

# Fluorinated materials as positive electrodes for Li- and Na-ion batteries

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This supplementary information brings together the main electrochemical performances of the fluorinated materials as a positive electrode in LIB and NIB configurations with the syntheses methods and the corresponding morphological characteristics. Fluorinated materials are classified along their structural dimensionality Theoretical capacities are given along exchanged electron number related to insertion or conversion together with the potential window and the current density (nC means that the current will charge or discharge the full capacity in 1/n h).

| Formulation | | Synthesis method | Morphology, size | Theo. capacity ($mAh.g^{-1}$) | Exp. capacity ($mAh.g^{-1}$) (cycle number) | Voltage range (V), Current density | Ref. |
|---|---|---|---|---|---|---|---|
| ***0D*** | | | | | | | |
| ***Cryolite structure type*** | | | | | | | |
| $\alpha$-$Li_3FeF_6$/C | | Precipitation | Microparticles | 140/1$e^-$ | 116(1) / 90(20) | 4.5-2.0, 0.2 $mA.cm^{-2}$ | 1 |
| $\alpha$-$Li_3FeF_6$/C | | Precipitation | Nanoparticles (<50 nm) | | 100 | 4.5-2.0, 0.1 $mA.cm^{-2}$ | 2,3 |
| $\beta$-$Li_3FeF_6$/C | | Precipitation | Nanoparticles (<50 nm) | | 80 | 4.5-2.0, 0.1 $mA.cm^{-2}$ | 3 |
| $\alpha$-$Li_3FeF_6$/C | | Precipitation | Nanoparticles (<20 nm) | | 140(1) / 20(30) | 4.0-2.0, C/18 | 4 |
| $\alpha$-$Li_3FeF_6$/C | | Sol-gel | Needles (13 nm) | | 110(1) / 70(100) | 4.5-2.0, C/20, 7 $mA.g^{-1}$ | 5 |
| $\alpha$-$Li_3FeF_6$/CNT | | Precipitation | Nanocomposites (100-300 nm) | | 120(1) / 75(50) | 4.5-2.0, 14 $mA.g^{-1}$ | 6 |
| $\alpha$-$Li_3FeF_6$/$Fe_2O_3$/LiF/C coated | | Precipitation | Nanocomposite (20 nm) | | 122(1) / 85(10) | 4.0-2.0, C/50 | 7 |
| $\alpha$-$Li_3VF_6$/AB | | Solvothermal (microwaves) | Microparticles | 144/1$e^-$ | 110(1) | 4.5-2.0, 0.2 $mA.cm^{-2}$ | 8 |
| $\alpha$-$Li_3Fe_{0.5}V_{0.5}F_6$/AB | | | | 142/1$e^-$ | 90(1) | | |
| $\beta$-$Li_3VF_6$/AB | | | | 144/1$e^-$ | 50(1) | | |
| $\beta$-$Li_3VF_6$/C | | Precipitation | Nanoparticles (<20 nm) | | 144(1) / 100(10) | 4.5-2.0, 0.1 $mA.cm^{-2}$ | 9 |
| $\alpha$-$Li_3CrF_6$/C | | Sol-gel, heating | Nanoparticles (40 nm) | 143/1$e^-$ | 111(1) / 80(10) | 4.5-1.5, C/20, 7 $mA.g^{-1}$ | 10 |
| $\beta$-$Li_3CrF_6$/C | | | Nanoparticles (200 nm) | | 106(1) / 90(10) | | |
| $Na_3FeF_6$/Super P | NIB | Ball-milling | Nanoparticles (100 nm) | 336/3$e^-$ | 120(1) / 60(20) | 4.25-0.5, C/10 | 11 |
| | LIB | | | | 500(1) / 200(20) | | |
| $Na_3FeF_6$/C | | Precipitation | Nanoparticles (200-500nm) | | 458(1) / 202(60) | 4.5-1.0, 50 $mA.g^{-1}$ | 12 |
| $Na_3FeF_6$/CNT | | Precipitation | Nanoparticles (500 nm) | | 428(1) / 297(60) | 4.5-1.0, 50 $mA.g^{-1}$ | 12 |
| $Na_3FeF_6$/AB | NIB | Precipitation | Microparticles (1-3 µm) | | 121(1) / 70(100) | 4.0-0.4, 0.1C | 13 |
| | LIB | | | | 473(1) / 203(100) | | |
| $Na_3FeF_6$/AB | NIB | Precipitation | Nanoparticles (150-250nm) | | 139(1) / 88(400) | 4.0-0.5, 0.05C | 14 |
| | LIB | | | | 511(1) / 245(400) | | |
| $Na_3FeF_6$/C | NIB | Microwave | Nanocomposite | | 185(1) / 45(20) | 4.0-0.5, 0.05C | 15 |
| | | Ball-milling | | | 165(1) / 28(20) | | |
| $K_3FeF_6$/C | | Hydrothermal | Nanoparticles (30-50 nm) | 279/3$e^-$ | 213(1) / 140(30) | 4.5-1.0, 0.2 $mV.s^{-1}$ | 16 |
| $Na_3VOF_5$/C | | Solvothermal | Microparticles | 151/1$e^-$ | - | 4.5-0.5, C/25 | 17 |
| ***1D*** | | | | | | | |
| **$FeF_3(H_2O)_2 \cdot H_2O$** | | | | | | | |
| $FeF_3(H_2O)_2 \cdot H_2O$/AB | | Precipitation | Nanocomposite with crystallites (100-1000 nm) | 160/1$e^-$ | 100(1) / 112(30) | 4.5-2.0, 23.7 $mA.g^{-1}$ | 18 |

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|---|---|---|---|---|---|---|---|
| $FeF_3(H_2O)_2 \cdot H_2O$/AB | | Precipitation | Naocomposites with cristallites (6-13 nm) | $481/3e^-$ | 342(1) / 111(35) | 4.5-1.0, 0.1C | 19 |
| | | | | | 92(1) / 83(100) | 4.5-2.0, 0.1C | |
| $FeF_3(H_2O)_2 \cdot H_2O$/CB | | Precipitation | Aggregates (170 nm) | | 350(1) / 280(4) | 4.5-1.0, 10 $mA.g^{-1}$ | 20 |
| | | | | | 160(1) / 100(50) | 4.5-2.0, 10 $mA.g^{-1}$ | |
| $FeF_3(H_2O)_2 \cdot H_2O$/AB | | Ball-milling | Nanoparticles (40-60 nm) | | 200(1) / 147(10) | 4.5-1.8, 20 $mA.g^{-1}$ | 21 |
| **$Na_2MnF_5$** | | | | | | | |
| $Na_2MnF_5$/C | NIB | Precipitation | Microparticles (10 μm) | $137/1e^-$ | 103(1) / 50(2) | 4.5-0.5, C/25 | 22 |
| | | | | | | | |
| $Ag_2V_4O_{11}$ (SVO) | | Solid | Microparticles | $315/7e^-$ | 270(1) / - | 3.5-1.0 | 23 |
| $Ag_4V_2O_6F_2$ (SVOF) | | Hydrothermal | Microparticles | $250/6e^-$ | 250(1) / - | 3.5-0.5 | 24 |
| $Ag_4V_2O_6F_2$ (SVOF) | | Precipitation | Microparticles (0.5 μm) | | 168(1) / - | 3.5-0.5 | 25 |
| $AgNa(VO_2F_2)_2$ | NIB | Hydrothermal | Microparticles | $432/6e^-$ | 125(1) / - | 3.5-0.5 | 26 |
| | LIB | | | | 90(1) / - | | |
| ***2D*** | | | | | | | |
| **$NaMF_4$** | | | | | | | |
| $NaVF_4$/C | NIB | Solvothermal | Microparticles | $179/1e^-$ | - | 4.5-0.5, C/25 | 17 |
| $NaMnF_4$/C | NIB | Dehydration | Microparticles | $174/1e^-$ | - | 4.5-0.5, C/25 | 22 |
| $NaFeF_4$/C | NIB | Solvothermal | Microparticles | $173/1e^-$ | 12(1) / 10(3) | 4.5-2.6, C/10 | 27 |
| **Chiolite** | | | | | | | |
| $Na_5V_3F_{14}$ | NIB | Solvothermal | Microparticles | $255/5e^-$ | - | 4.5-0.5, C/25 | 17 |
| $Na_5Ti_3O_3F_{11}$ | NIB | Solvothermal | Microparticles | $260/5e^-$ | - | 4.5-0.5, C/25 | |
| ***3D*** | | | | | | | |
| **Rutile** | | | | | | | |
| $FeF_2$ | | Pulsed Laser Deposition | Thin films (thickness 140nm) | $572/2e^-$ | 750(2) / 745(17) | 3.6-0.05, 2.8 $\mu A\ cm^{-2}$ | 28 |
| $FeF_2$/C | | Precipitation, decomposition | Nanoparticles (10 nm) | | 480(1) / 480(5) | 4.5-1.5, 4 $mA\ g^{-1}$ | 29 |
| $FeF_2$/C | | Reverse micro-emulsion | Micro and Nanorods | | 590(1) / 220(25) | 5.0-1.0, 20 $mA\ g^{-1}$ | 30 |
| $FeF_2$/C | NIB | Precipitation | Nanoparticles (10-20 nm) | | 190(1) / 70(6) | 3.5-1.0, 10 $mA\ g^{-1}$ | 31 |
| $FeF_2$@CNT (core/shell) | | Solid | Nanorods (200-500nm x 2-4μm) | | 263(1) / 263(50) | 4.2-1.0, 50 $mA\ g^{-1}$ | 32 |
| $FeF_2$@C (core/shell) | | Solid | Short rods (100nm-1μm x 1 μm) | | 314(1) / 217(50) | 4.3-1.2, 30 $mA\ g^{-1}$ | 33 |
| Nanoconfined $FeF_2$/C nanopores | | Decomposition | Nanocomposite (100 nm) | | 120(1) / 100(200) | 4.0-1.5, 150 $mA\ g^{-1}$ | 34 |
| $FeF_2$@CMK-3 | | Fluorination | Nanoparticles | | 529(1) / 482(1000) | 4.4-1.4, 500 $mA\ g^{-1}$ | 35 |
| $FeF_2$/C | | Precipitation/Decomposition | Nanocomposite (20 nm) | | 519(1) / 80(20) | 4.5-1.5, 50 $mA\ g^{-1}$ | 36 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $FeF_2$/C nanopores | | Decomposition | Nanocomposite particles (1 µm) | 572/2e$^-$ | 450(1) / 300(1000) | 4.0-1.5, 140 mA g$^{-1}$ | 37 |
| $FeF_2$/C | LIB | Precipitation/Decomposition | Nanoparticles (20-300 nm) | | 470(1) / 110(50) | 4.2-1.5, 100 mA g$^{-1}$ | 38 |
| | NIB | | | | 115(1) / 50(50) | 4.0-1.2, 100 mA g$^{-1}$ | |
| Ni@$FeF_2$@$Al_2O_3$ | | Electrodeposition/fluorination/atomic layer deposition | Open porous structure | | 473(1) / 200(100) | 4.2-1.2, 200 mA g$^{-1}$ | 39 |
| $FeF_2$/rGO-PAA (binder) | NIB | Precipitation/heating | Nanocomposite (10-20 nm) | | 135(1) / 120(120) | 4.5-1.5, 200 mA g$^{-1}$ | 40 |
| $FeF_2$@CNT/SPE | | Solid | Nanoparticles (10-20 nm) | | 700(1) / 450(100) | 4.0-1.0, 50 mA g$^{-1}$ | 41 |
| $FeF_2$/C | | Catalytic decomposition PFPE | Nanaparticles (10 nm) | | 500(1) – 50(20) | 4.5-1.0 – C/20 | 42 |
| $FeF_2$@MHCS/C | NIB | Infiltration/heating | Nanocomposite particles (4-20 nm) | | 134(1) / 112(100) | 4.5-1.5, 200 mA g$^{-1}$ | 43 |
| $FeF_2$@GC (MOF) | NIB | Carbonization/Precipitation/Solvothermal | Nanocomposite (10-15 nm) | | 611(1) / 120(300) | 4.5-0.8, 50 mA g$^{-1}$ | 44 |
| $FeF_2$/C/LP30(electrolyte) (RT) | | Colloidal synthesis | Nanorods (20 nm) | | 755(1) / 0(50) | 4.0-1.0, C/20 | 45 |
| $FeF_2$/C/IL(electrolyte) (50°C) | | | | | 700(1) / 525(50) | 4.0-1.0, C/20 | |
| $FeF_2$@rGO/C | | fluorination | Porous composite | | 430(1) / 400(50) | 4.0-1.0, 80 mA g$^{-1}$ | 46 |
| $NiF_2$ | | Pulsed Laser Deposition | Thin Film | 554/2e$^-$ | 650(1) / 465(100) | 3.5-0.01, 10 µA.cm$^{-2}$ | 47 |
| $NiF_2$/C | | Ball-milling | Nanoparticles | | 1100(1) / 200(10) | 4.0-0.5, 5.5 mA g$^{-1}$ | 48 |
| $NiF_2$/C | | Heating | - | | 740(1) / 700(2) | 4.5-1.0, 16 mA g$^{-1}$ | 49 |
| $MnF_2$/C | | Solvothermal/IL | Nanoparticles (100-300 nm) | 576/2e$^-$ | 725(1) / 237(5000) | 3.0-0.01, 10C | 50 |
| $MnF_2$ | | Solvothermal/IL | 3D nanorods (20x200 nm) | | 960(1) / 420(2000) | 3.0-0.01, 10C | 51 |
| $MnF_2$/graphene | | Solvothermal/IL | Nanoparticles (50-200 nm) | | 250(1) / 290(4000) | 3.0-0.01, 6 A g$^{-1}$ | 52 |
| $MnF_2$/C | LIB | Precipitation/Decomposition | Nanoparticles (20-300 nm) | | 100(1) / 55(100) | 4.2-1.5, 100 mA g$^{-1}$ | 38 |
| | NIB | | | | 100(1) / 50(100) | 4.0-1.2, 100 mA g$^{-1}$ | |
| $MnF_2$/MWCNT | | Precipitation/decomposition | Hierarchical composite (140 nm) | | 665(1) / 480(100) | 4.0-0.5, 5.5 mA g$^{-1}$ | 53 |
| $CoF_2$ | | Pulsed Laser Deposition | Thin Film | 552/2e$^-$ | 600(1) / 160(8) | 3.5-0.01, 10 µA.cm$^{-2}$ | 54 |
| $CoF_2$/MWCNT(NC3100) | | Precipitation/heating | Nanoparticles (20 nm) | | 560(1) / 320(10) | 4.3-1.0, 50 mA g$^{-1}$ | 55 |
| $CoF_2$/C | | Reverse micro-emulsion | Microspheres (0.7-1.8 µm) | | 535(1) / 30(25) | 4.8-1.2, 20 mA g$^{-1}$ | 30 |
| $CoF_2$/AB | LIB | Precipitation/heating | Nanoparticles (10 nm) | | 858(1) / 166(100) | 3.2-0.01, 111 mA g$^{-1}$ | 56 |
| | NIB | | | | 402(1) / 47(30) | 3.0-0.01, 553 mA g$^{-1}$ | |

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|---|---|---|---|---|---|---|---|
| $CoF_2$@CNT |  | CVD/Infiltration/Decomposition | Nanocomposite (30-50 nm) | 552/2e$^-$ | 360(1) / 335(200) | 4.0-1.0, 100 mA g$^{-1}$ | 57 |
| $CoF_2$/C |  | Solvothermal | Porous nanospheres (150-500 nm) |  | 538(1) / 127(30) | 4.8-1.0, 20 mA g$^{-1}$ | 58 |
| $CoF_2$/C | LIB | Precipitation/Decomposition | Nanoparticles (20-300 nm) |  | 280(1) / 70(50) | 4.2-1.5, 100 mA g$^{-1}$ | 38 |
|  | NIB |  |  |  | 100(1) / 65(50) | 4.0-1.2, 100 mA g$^{-1}$ |  |
| $CoF_2$@CFC |  | Solvothermal/IL | Composite (30-40 nm) |  | 685(1) / 330(200) | 4.0-1.0, 100 mA g$^{-1}$ | 59 |
| $CoF_2/Fe_2O_3$/C (Fe-Co-ZIF) |  | Precipitation/Pyrolysis | Nanoparticles (500 nm) |  | 387(1) / 198(100) | 4.5-1.2, 50 mA g$^{-1}$ | 60 |
| $CoF_2$@C (MOF-67) |  | Carbonization/Fluorination | MOF-67 shaped nanocompsite (5-20 nm) |  | 472(1) / 380(200) | 4.0-1.0, 0.2C | 61 |
| $CuF_2$/C |  | Ball-milling | Nanoparticles | 528/2e$^-$ | 303(1) | 4.0-2.0, C/35 | 62 |
| $CuF_2$/C |  | Solvothermal | Nano (50-100 nm) |  | 350(1) / 40(3) | 4.5-2.0, 0.1C | 63 |
| $Ni_{0.75}Co_{0.25}F_2$/ |  | Precipitation/heating | Nanoparticles (16-22 nm) | 553/2e$^-$ | 700(1) / 460(10) | 4.3-1.0, 50 mA g$^{-1}$ | 64 |
| $Fe_{0.9}Ni_{0.1}F_2$/MWCNT |  | Precipitation/decomposition | Nanoparticles (100 nm) | 570/2e$^-$ | 425(1) / 175(50) | 4.0-1.0, 140 mA g$^{-1}$ | 65 |
| $Fe_{0.5}Cu_{0.5}F_2$/C |  | Ball-milling | Nanoparticles | 547/2e$^-$ | 575(1) / 480(5) | 4.5-1.0, 9.2 mA g$^{-1}$ | 66 |
| $NiF_2$/C |  | Precipitation/Decomposition | Nanoparticles (20 nm) | 554/2e$^-$ | 445(1) / 40(6) | 4.0-1.0, C/10 | 67 |
| $Cu_{0.1}Ni_{0.9}F_2$/C |  |  | Nanoparticles (20 nm) | 553/2e$^-$ | 548(1) /155(6) |  |  |
| $Cu_{0.25}Ni_{0.75}F_2$/C |  |  | Nanoparticles (50-150 nm) | 547/2e$^-$ | 552(1) / 220(6) |  |  |
| $CuF_2/MoO_3$/C |  | Ball-milling | Nanoparticles (2-30 nm) | 528/2e$^-$ | 450(1) | 3.5-2.0, 7.58 mA g$^{-1}$ | 68 |
| FeOF/C |  | Precipitation/heating | Nanoparticles (7-15 nm) | 885/3e$^-$ | 410(1) / 280(60) | 4.5-1.5, 50 mA g$^{-1}$ (60°C) | 69 |
| FeOF/C |  | *Roll quenching* | - |  | 900(1) / 40(10) | 4.0-0.7, 10 mA g$^{-1}$ | 70 |
|  |  |  |  |  | 560(1) / 360(30) | 4.0-1.3, 10 mA g$^{-1}$ |  |
| FeOF/C |  | Solvothermal | Nanorods (<1 $\mu$m) |  | 410(1) / 340(20) | 4.5-1.5, 50 mA g$^{-1}$ (60°C) | 71 |
| FeOF@PEDOT |  | Solvothermal/Polymerization | Core-shell Nanorods (<1 $\mu$m) |  | 560(1) / 430(150) | 4.2-1.2, 50 mA g$^{-1}$ | 72 |
| FeOF@PEDOT |  | Solvothermal/Polymerisation | Coated Nanorods (30-50nm x 1 $\mu$m) |  | 165(1) / 125(200) | 3.8-2.0, 100 mA g$^{-1}$ (60°C) | 73 |
| FeOF/$FeF_3$/C |  | Ball-milling/oxidation process | Nanoparticles |  | 438(1) / 130(50) | 4.5-1.5, 20 mA g$^{-1}$ | 74 |
| FeOF/rGO |  | Solvothermal/reduction process | Nanorods (30 x 500 nm) |  | 400(1) / 327(100) | 4.5-1.5, 100 mA g$^{-1}$ | 75 |
| LiF/FeO composite/C (Cubic FeOF) |  | Ball-milling | Nanoparticles (20-50 nm) | 295/1e$^-$ | 225(1) / 275(30) | 4.8-1.5, 50 mA g$^{-1}$ (60°C) | 76 |
| $FeO_{0.7}F_{1.3}$/C | NIB | Precipitation | Nanocomposite (15 nm) | 885/3e$^-$ | 496(1) / 360(50) | 3.5 -1.0, 25 mAg$^{-1}$ (50°C) | 77 |
| FeOF/C | NIB | Solvothermal | Hierarchical Nanorods (20-35 nm) |  | 450(1) / 130(70) | 4.0-1.0, 20 mAg$^{-1}$ | 78 |

|  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|
| FeOF/C | NIB | Solution Plasma Processing | Mesoporous amorphous Nanococoons (75x25 nm) | 885/3e$^{-}$ | 290(1) / 270(100) | 3.8-1.3, 1 mAg$^{-1}$ (50°C) | 79 |
| FeOF/C | NIB | *Roll quenching* | - |  | 240(1) / 210(20) | 4.0-1.0, 10 mA g$^{-1}$ | 80 |
| FeOF/rGO | NIB | Solvothermal/Thermal reduction | Nanoparticles (20-35 x 80-110 nm) |  | 283(1) / 220(100) | 4.0-1.2, 20 mAg$^{-1}$ | 81 |
| FeOF/GCL (MOF) | NIB | Solvothermal/Oxydation process | Nanoparticles (50 nm) |  | 437(1) / 338(100) | 4.0-1.2, 100 mA g$^{-1}$ | 82 |
| FeOF/GC (rosin acid) | NIB | Solvothermal/Oxydation process | Wrapped Nanospheres (10-20 nm) |  | 449(1) / 357 | 4.0-1.2, 100 mA g$^{-1}$ | 83 |
| $Co_{0.1}Fe_{0.9}OF$ |  | Solvothermal | Nano (50-100 nm) |  | 550(1) / 350(1000) | 4.0-1.2, 500 mA g$^{-1}$ | 84 |
| **Dirutile** |  |  |  |  |  |  |  |
| $LiMnF_4$ |  | Ball-milling | Nano (100-200 nm) | 194/1e$^{-}$ | 30(1) / 45(2) | 4.5-2.0, C/50 | 85 |
| **Trirutile** |  |  |  |  |  |  |  |
| $LiFe_2F_6$/C |  | Ball-milling | Nanoparticles | 230/2e$^{-}$ | 126(1) / 78(14) | 4.5-2.0, C/12 | 86 |
| $Li_{1.2}Fe_2F_6$/C |  | Ball-milling | Nanoparticles | 228/2e$^{-}$ | 155(1) / 137(27) | 4.5-2.0, C/12 | 86 |
| $LiMgFeF_6$/C |  | Sol-gel/heating | Nano (100-200 nm) | 133/1e$^{-}$ | 90(1) / 110(20) | 4.5-2.0, C/20 | 87 |
| $LiNiFeF_6$/C |  | Sol-gel/heating | Nano (100-200 nm) | 114/1e$^{-}$ | 95(1) / 88(20) | 4.5-2.0, C/20 | 88 |
| $Li_2TiF_6$/C |  | Atomization | Nano (500 nm) | 152/1e$^{-}$ | 110(1) / 80(16) | 4.5-2.0, 0.2 mAg$^{-1}$ | 89 |
| **Colquiriite** |  |  |  |  |  |  |  |
| $LiCaFeF_6$/C |  | Solid/Ball-milling | Nanoparticles (240 nm) | 124/1e$^{-}$ | 112(1) / 95(20) | 4.5-2.0, C/20 | 90 |
| **$Na_2SiF_6$** |  |  |  |  |  |  |  |
| $LiMnFeF_6$/C |  | Sol-gel/heating | Nano (250 nm) | 116/1e$^{-}$ | 95(1) / 73(10) | 4.3-2.2, C/20 | 91a |
| HP-$LiFe_2F_6$/AB |  | High-pressure | Microparticles | 116/1e$^{-}$ | 155(1) / 102(10) | 4.5-2.0, C/20 | 91b |
| **Inverse Spinel** |  |  |  |  |  |  |  |
| $Li_2NiF_4$/C |  | Sol-gel | Microparticles | 180/1e$^{-}$ | 750(1) / 31(20) | 3.8-0.6, 9 mAg$^{-1}$ | 92 |
| $Li_2NiF_4$/PEDOT |  | Solvothermal | Nanocomposite |  | 550(1) / 303(40) | 3.8-0.5, 10 mAg$^{-1}$ | 93 |
| $Li_2NiF_4$/C |  | ball-milling / calcination | Microparticles? |  | 96(1) | 4.8-2.0, C/20 | 94 |
| 2LiF-NiO/C |  | Ball-milling | Nanocomposite | - | 146(1) | 4.8-2.0, C/10 | 94 |
| MnO-$LiPF_6$ |  | *In situ* | - | - | 330(1) / 220(5) | 4.5-1.5, C/50 | 95,96 |
| **$BiF_3$/BiOF** |  |  |  |  |  |  |  |
| $BiF_3$/C |  | Ball-milling | Nanoparticles | 302/3e$^{-}$ | 225(1) / 200(15) | 4.5-2.0, 45 mA g$^{-1}$ | 97,98 |
| $BiF_3$/C (55°C) |  | Ball-milling | - |  | 314(1) / 183(10) | 4.5-2.0, 0.1C | 99 |
| BiOF/C |  | Ball-milling | Nanoparticles | 330/3e$^{-}$ | 180(1) / 100(5) | 4.5-1.8, 23 mA g$^{-1}$ | 100 |
| $BiO_{0.5}F_2$/C |  | Ball-milling | Nanoparticles | 315/3e$^{-}$ | 250(1) / 187(3) | 4.5-2.0, 7.6 mA g$^{-1}$ | 100 |
| $BiO_{0.5}F_2$@CMK-3 |  | Infiltration/Heating | Nanoparticles (20 nm) composite |  | 343(1) / 148(40) | 4.5-1.5, 30 mA g$^{-1}$ | 101 |

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|---|---|---|---|---|---|---|---|
| **Weberite** |  |  |  |  |  |  |  |
| Na$_2$Fe$_2$F$_7$/C | NIB | Solvothermal | Nanoparticles (500 nm) | 184/2e$^-$ | 58(1) / 50(30) | 3.8-2.6, 0.1C | 27 |
| Na$_2$Fe$_2$F$_7$/C | NIB | Ball-milling/heating | Nanoparticles (25-250 nm) |  | 135(1) / 115(1000) | 4.3-1.5, 2C | 102 |
| Na$_2$FeVF$_7$/C | NIB | Ball-milling/heating | Nanoparticles (200 nm) | 188/2e$^-$ | 105(1) / 100(200) | 4.5-1.5, 100 mA g$^{-1}$ | 103 |
| Na$_2$MnVF$_7$/C | NIB | Ball-milling/heating | Nanoparticles (200 nm) | 146/2e$^-$ | 85(1) / 80(200) | 4.5-1.5, 100 mA g$^{-1}$ | 103 |
| Na$_2$CoVF$_7$/C | NIB | Ball-milling/heating | Nanoparticles (200 nm) | 145/2e$^-$ | 65(1) / 60(200) | 4.5-1.5, 100 mA g$^{-1}$ | 103 |
| **Perovskite** |  |  |  |  |  |  |  |
| NaFeF$_3$/C | NIB | Ball-milling | Agglomerats (6 µm) | 197/1e$^-$ | 125(1) / 100(20) | 4.0-1.5, 0.2 mA cm$^{-2}$ | 104 |
| NaFeF$_3$/C | NIB | Precipitation | Nanoparticles (500 nm) |  | 253(1) | 4.0-1.5, 0.1C | 105 |
| NaFeF$_3$/C | NIB | Roll-quenching | Nanoparticles (10-20 nm) |  | 200(1) | 4.5-1.5, 0.014C | 106 |
| NaFeF$_3$/AB | NIB | Ball-milling | Nanoparticles (30 nm) |  | 200(1) / 250(10) | 4.5-1.5, 7.5 mA g$^{-1}$ | 107 |
| NaFeF$_3$/AB | NIB | Ball-milling | Nanoparticles (20-100nm) |  | 169(1) / 100(20) | 4.3-2.0, 0.1 mA cm$^{-2}$ | 108 |
| NaFeF$_3$/C | NIB | Solvo. microwaves | Nanoparticles (500 nm) |  | 200(1) / 140(60) | 4.0-2.0, 0.1C | 109 |
|  | LIB |  |  |  | 200(1) / 200(60) | 4.0-2.0, 0.33C |  |
| NaFeF$_3$/C | NIB | Solvothermal | Nanoparticles (200 nm) |  | 153(1) / 75(200) | 4.5-1.5, 1C | 110 |
|  | LIB |  |  |  | 183(1) / 100(200) |  |  |
| NaFeF$_3$/C | NIB | Precipitation | Nanoparticles (100 nm) |  | 154(1) / 119(400) | 4.0-1.5, 0.05C | 14 |
|  | LIB |  |  |  | 181(1) / 158(400) | 4.2-2.0, 0.05C |  |
| NaCuF$_3$/AB | NIB | Ball-milling | Nanoparticles (30 nm) | 372/2e$^-$ | 200(1) / 50(7) | 4.5-1.5, 7.5 mA g$^{-1}$ | 107 |
| NaNiF$_3$/C | NIB | Ball-milling | Agglomerats (7.6 µm) | 193/1e$^-$ | 30(1) / 42(2) | 4.0-1.5, 0.2 mA cm$^{-2}$ | 104 |
| NaNiF$_3$/AB | NIB | Ball-milling | Nanoparticles (30 nm) |  | 40(1) / 35(1) | 4.5-1.5, 7.5 mA g$^{-1}$ | 107 |
| NaCoF$_3$/AB | NIB | Ball-milling | Nanoparticles (30 nm) | 193/1e$^-$ | 45(1) / 40(2) | 4.5-1.5, 7.5 mA g$^{-1}$ | 107 |
| NaCoF$_3$/AB | NIB | Ball-milling | Nanoparticles (20-100nm) |  | 38 (1) / - | 4.6-2.0, 0.1 mA cm$^{-2}$ | 108 |
| NaCoF$_3$/rGO |  | Solvothermal | Nanoparticles (20 nm)/nanocluster (300-500 nm) |  | 514 (1) / 350 (5) | 4.0-1.0, 20 mAg$^{-1}$ | 111 |
| NaMnF$_3$/C | NIB | Ball-milling | Agglomerats (10 µm) | 198/1e$^-$ | 32(1) / 37(2) | 4.0-1.5, 0.2 mA cm$^{-2}$ | 104 |
| NaMnF$_3$/AB | NIB | Ball-milling | Nanoparticles (30nm) |  | 50(1) / 48(2) | 4.5-1.5, 7.5 mA g$^{-1}$ | 107 |
| NaMnF$_3$/AB | NIB | Ball-milling | Nanoparticles (20-100nm) |  | 89(1) / 40(20) | 4.6-2.0, 0.1 mA cm$^{-2}$ | 108 |
| KFeF$_3$/C | NIB | Precipitation | Nanoparticles (100 nm) | 180/1e$^-$ | 170(1) / 110(35) | 4.5-1.5, 0.1C | 112 |
| KFeF$_3$/C | LIB | Ball-milling | Microparticles (1µm) |  | 140(1) / 80(80) | 4.5-1.8, C/30 | 113 |
|  | NIB |  |  |  | 120(1) / 90(30) | 4.2-1.8, C/30 |  |
| AgCuF$_3$/C |  | Ball-milling | Nanoparticles (20-40nm) | 234/2e$^-$ | 264(1) | 4.0-2.0, 7.58 mA g$^{-1}$ | 114 |
| FeF$_3$/C (50:50 wt %) |  | Ball-milling | Nanodomains (25-30 nm) | 237/1e$^-$ | 200(1) / 140(10) | 4.5-2.5, 7.58 mA g$^{-1}$ | 115 |

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|---|---|---|---|---|---|---|---|
| $FeF_3$/CB (85:15 wt %) | | Ball-milling | Nanoparticles (34 nm) | $712/3e^-$ | 660 (2) / 600(12) | 4.5-1.5, 7.58 mA $g^{-1}$ (70°C) | 116 |
| $FeF_3$/C (75:25 wt %) | | Ball-milling (*In situ* redox) | Nanoparticles (20 nm) | | 380(1) / 315(12) | 4.5-1.5, 7.58 mA $g^{-1}$ | 117 |
| $FeF_3$/AB | LIB | Ball-milling | Nanoparticles | $237/1e^-$ | 210(1) / 150(40) | 4.0-2.0, 0.2 mA $cm^{-2}$ | 118 |
| | NIB | | | | 150(1) / 90(10) | 4.0-1.5, 0.2 mA $cm^{-2}$ | |
| ($FeF_3$/CNT)/C | | Precipitation, heating | $FeF_3$ nanoflowers (10nm) on CNTs | $237/1e^-$ | 210(1) / 200(30) | 4.5-2.0, 20 mA.$g^{-1}$ | 119 |
| $FeF_3$/AB | | Precipitation with PEG, heating | Nanoparticles (15 nm), no agglomerates | $712/3e^-$ | 860(1) / 742(10) | 4.5-1.0, 100 mA.$g^{-1}$ | 120 |
| | | Precipitation with CTAB, heating | Nanoparticles (10 nm) | | 615(1) / 615(10) | | |
| | | Solvothermal, heating | Nanoparticles (10-20 nm) | | 550(1) / 547(10) | | |
| $FeF_3$/AB | | Ball-milling, heating | Nanoparticles (30nm) | $237/1e^-$ | 210(1) / 170(55) | 4.5-2.0, 10 mA.$g^{-1}$ | 121 |
| $FeF_3/\Sigma FeF_2$/C | | Precipitation, thermal dehydration | Porous nanowires (15µmx30-90nm) | $712/3e^-$ | 543(1) / 100(100) | 4.5-1.5, 50 mA.$g^{-1}$ | 122 |
| $FeF_3$/CB | | Ball milling | Nanoparticles (80-160nm) | | 710(1) / 284(100) | 4.5-1.5, 21 mA.$g^{-1}$ | 123 |
| $FeF_3$@$Fe_3O_4$ core-shell | | Sol-gel, fluorination, heating | Core ($FeF_3$, 100-150nm)-shell ($Fe_3O_4$, 5nm) composite | $237/1e^-$ | 200(1) / 80(12) | 4.5-2.0, 50 mA.$g^{-1}$ | 124 |
| $FeF_3$/AB | | Solid state reaction(PTFE) | Nanoparticles (20-100 nm) | 712/3e- | 387(1) / 320(5) | 4.5-1.0, 0.1C | 125 |
| $FeF_3$/AB | | Thermal evaporation and decomposition | Nanoparticles (30 nm) | $237/1e^-$ | 224(1) / 143(100) | 4.5-2.0, 0.1C | 126 |
| ($FeF_3$/Graphene)/CB | | Vapour solid autoclave method,heating | Rectangular rods (300x150 nm) wrapped by multi-sheet graphene | | 245(1) /186(100) | 4.5-1.5, 21 mA.$g^{-1}$ | 127 |
| ($FeF_3$/C composite)/no CB | | Vapour solid autoclave method,heating | $FeF_3$ rods (150-400nm) into porous carbon matrix | $712/3e^-$ | 610(1) / 197(50) | 4.5-1.5, 21 mA.$g^{-1}$ | 128 |
| $FeF_3$/rGO | | Precipitation, thermal dehydration | Nanocomposite, nanoparticles (70 nm) | $237/1e^-$ | 150(1) / 135(50) | 4.5-1.7, 500 mA.$g^{-1}$ | 129 |
| $FeF_3$-graphene/C | | Precipitation, thermal dehydration | Nanoparticles (20-100 nm) on graphene sheets | | 75(1) / 67(50) | 4.5-2.0, 10C | 130 |
| $FeF_3$/OMC | | Solid template method (CCT) | Composite, nanoparticles (12, 23 nm) | $237/1e^-$ | 163(1) / 135(30) | 4.5-2.0, 0.1C | 131 |
| $FeF_3$/C | | Precipitation | Nanoparticles (5-10 nm) | $712/3e^-$ | 606(1) / 50(35) | 4.5-1.0, 0.1C | 19 |
| | | | | | 170(1) / 110(100) | 4.5-2.0, 0.1C | |
| ($FeF_3$/Fe/rGO)/AB | NIB | Freeze drying, heating, electrochemical activation from $FeF_2$-rGO | $FeF_2$ particles (20-40nm) on the rGO sheet | - | 125(1) / 70(1000) | 4.5-2.0, 100 mA.$g^{-1}$ | 132 |
| ($FeF_3$/graphene)/C | NIB | Precipitation | Nano-sized composite (2-30nm) | $237/1e^-$ | 210(1) / 106(50) | 4.2-1.5, 60 mA.$g^{-1}$ | 133 |
| $FeF_3$/printex C | | Ball-milling assisted low-temperature | Nanoparticles (10-20nm) in agglomerats (200x100nm) | | 225(1) / 150(60) | 4.5-2.0, 100 mA.$g^{-1}$ | 134 |
| ($FeF_3$/graphene)/ C | | | | | 235(1) /155(60) | | |

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|---|---|---|---|---|---|---|---|
| ($FeF_3$/amorphous C)/C |  | low-temperature precipitation, heating | Nanocomposite, $FeF_3$ particles (20-30nm) |  | 224(1) / 130(60) |  |  |
| $FeF_3$/CMB |  | Fluorination | Porous hybrid composite, nanocrystals (1-4 nm) | 712/$3e^-$ | 450(1) / 336(500) | 4.5-1.5, 1 A.g$^{-1}$ | 135 |
| ($FeF_3$/graphene)/SP | NIB | Sol-gel method, heating | Composite ($FeF_3$ nanosheets +graphene sheets (100 nm->10µm)) |  | 344(1) / 116(50) | 4.0-1.0, 0.3C | 136 |
| ($FeF_3$/rGO)/CB |  | Hydrothermal, heating dehydration | Composite,$FeF_3$ submicron microspheres with particles (30-40nm) | 237/$1e^-$ | 196(1) / 169(50) | 4.5-2.0, 0.1C | 137 |
| ($FeF_3$/mesoporous ACF)/CB |  | Impregnation, heating | $FeF_3$ nanoparticles (5-6nm) inside pores (6nm) of mesoporous carbon |  | 195(1) / 181(50) | 4.5-2.0, 0.1C | 138 |
| $FeF_3$@NAN/AC |  | Encapsulation, heating | Core ($FeF_3$ nanospheres (8 nm)) -shell (NAN) hybrid architecture | 712/$3e^-$ | 426(1) / 328(400) | 4.5-1.0, 71 mA.g$^{-1}$ | 139 |
| $FeF_3$/graphitic carbon/CB |  | Polymerization, heating, fluorination, dehydration heating | Nanocomposite (worm-like nanoparticles (10-20 nm) wrapped by carbon matrix (5-7 nm) | 237/$1e^-$ | 188(1) / 166(50) | 4.5-2.0, 23.7 mA.g$^{-1}$ | 140 |
| Fe/LiF/CB |  | Ball-milling | Nanocomposites (Fe, Li nanoparticles (6 nm) and C) | 712/$3e^-$ | 430(1) / 310(50) | 4.5-1.2, 225 mA.g$^{-1}$ | 141 |
| $FeF_3$/AB |  | $F_2$ fluorination | Low crystallinity (pore size 3 nm) |  | 676(1) / 95(15) | 4.5-1.0, 71 mA.g$^{-1}$ | 142 |
| $FeF_3$/amorphous C |  | Solid state reaction, decomposition | Nanoparticles (10-40 nm) covered by amorphous carbon | 237/$1e^-$ | 250(1) / 127(100) | 4.5-2.0, 50 mA.g$^{-1}$ | 143 |
| $FeF_3$/AC |  | Ball-milling, heating | Boron-based additives in electrolyte | 712/$3e^-$ | 624(2) / 540(10) - | 4.5-1.0, 0.05C | 144 |
| $FeF_3$/AC |  | Gaseous fluorination 350°C | hierarchized macroporous/ mesoporous texture |  | 317(1) / 80(20) | 4.3-2.5, 0.05C, 60°C | 145 |
| $FeF_3$/rGO/C | LIB | Thermal decomposition | Nanoparticles (5-20 nm) | 237/$1e^-$ | 220(1) / 152(100) | 4.2-2.0, 50 mA g$^{-1}$ | 38 |
|  |  |  |  |  | 525(1) / 360(20) | 4.2-1.5, 0.2 A g$^{-1}$ |  |
|  | NIB |  |  |  | 160(1) / 145(100) | 4.0-1.6, 0.2 A g$^{-1}$ |  |
| $FeF_3$/Super P |  | Thermal decomposition of $(NH_4)_3FeF_6$ nanocrystals | Porous agglomerates of nanoparticles (5-20 nm) |  | 220(1) / 188(50) | 4.5-2.0, 0.2C | 146 |
| $FeF_3$/PHCNF interlayer |  | Solvothermal, thermal dehydration | Spindle-shaped agglomerates (10-50 µm) with nanoparticles (20 nm) |  | 254(1) / 217(40) | 4.5-2.0, 20 mA.g$^{-1}$ | 147 |
| $FeF_3$/AB |  | Ball-milling | - | 712/$3e^-$ | 566(1) / 20(50) | 4.5-1.0, 0.2 mA cm$^{-2}$ | 148 |
|  |  |  |  | 237/$1e^-$ | 180(1) / 130(50) | 4.5-2.0, 0.2 mA cm$^{-2}$ |  |
| $FeF_3$/AC |  | Solvothermal, thermal dehydration | Amorphous and crystallized fusiform porous particles (>10 µm x 20 nm) |  | 125(1) / 137(100) | 4.5-2.0, 20 mA.g$^{-1}$ | 149 |
| $FeF_3$/C |  | Solvothermal | Nanocomposite (carbon wrapped $FeF_3$ particles 50-60 nm) |  | 166(1) / 126(100) | 4.5-2.0, 20 mA.g$^{-1}$ | 150 |
| $FeF_3$/AC |  | Ball-milling | Nanocomposite (Particles (10-30 nm) | 712/$3e^-$ | 346(1) /161(40) | 4.0-1.0, 50 mA.g$^{-1}$ | 151 |

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|---|---|---|---|---|---|---|---|
| FeF$_3$/C nanofibers | | Electrospinning, carbonization/reduction, fluorination (NF$_3$) | Nanocomposite (nanofibers (>10 µm x 300-500 nm), nanoparticles (20-50 nm)) | | 500(1) / 500(400) | 4.0-1.0, 100 mA.g$^{-1}$ | 152 |
| FeF$_3$/MWCNT//Li-B | | Precipitation, thermal dehydration | Microcrystals (1-3x5-10 µm) | 237/1e$^-$ | 160 (500°C) | 3.27 -100 mA.m$^{-2}$ | 153 |
| FeF$_3$/C | | Ball-milling | Nanoparticles | 712/3e$^-$ | 600(1) / 372(30) | 4.5-1.0, 0.05C | 154,155 |
| FeF$_3$/C | | Ball-milling | Nanoparticles (13 nm) | | 610(1) / 380(30) | 4.5-1.0, 0.1C | 156 |
| FeF$_3$/3D honeycomb carbon framework | | Sol-gel,carbonization, fluorination (Ar/NF$_3$) | Nanospheres (10-50 nm), composite | 237/1e$^-$ | 211(1) / 64(1000) | 4.5-1.0, 5C | 157 |
| FeF$_3$/C | | Catalytic decomposition PFPE | Nanoparticles (5-10 nm) | | 210(1) / 147(50) | 4.5-1.0, C/20 | 42 |
| FeF$_3$/C | | Solid gaz F$_2$ reaction | Microcrystalline powder | 712/3e$^-$ | 200(1e$^-$), 700 (3e$^-$) | 3.5-1.0, 20 mA.g$^{-1}$ | 158 |
| FeF$_3$/C nanocages | | Solvothermal, thermal dehydration | Porous Nanocomposite (nanocrystals, 3-9 nm) | | 610(1) / 410(120) | 4.5-1.7, 100 mA.g$^{-1}$ | 159 |
| Fe$_{0.99}$Ti$_{0.01}$F$_3$/C | | Hydrothermal/heating/ ball-milling | Nanocomposite (20-100 nm) | 237/1e$^-$ | 194(1) / 174(30) | 4.5-2.5, 0.1C | 160 |
| FeF$_3$/MWCNT | | Solvothermal/heating | Nanocomposite (50-200 nm) | | 192(1) / 161(50) | 4.5-2.0, 0.2C | 161 |
| Fe$_{0.96}$Co$_{0.04}$F$_3$/MWCNT | | | | | 217(1) / 188(50) | | |
| FeF$_3$/C | | Pyrolysis | Porous spheres (100nm) with nanocages (5 nm) | | 145(1) / 60(100) | 4.5-2.0, 50 mA.g$^{-1}$ | 162 |
| Fe$_{0.99}$Co$_{0.01}$F$_3$/C | | | | | 175(1) / 114(100) | | |
| Fe$_{0.97}$Co$_{0.03}$F$_3$/C | | | | | 175(1) / 80(100) | | |
| MnF$_3$/AB | LIB | Ball-milling | Nanoparticles | 239/1e$^-$ | 52(1) / 25(2) | 4.5-2.0, 0.2 mA cm$^{-2}$ | 118 |
| | NIB | | | | 72(1) / 18(2) | 4.0-1.5, 0.2 mA cm$^{-2}$ | |
| CoF$_3$/C | | Fluorination (100°C) | Nanoparticles (11 nm) | 693/3e$^-$ | 1011(1) / 400(14) | 4.5-0.02, 5 mA g$^{-1}$ | 163 |
| CoF$_3$/AB | LIB | Ball-milling | Nanoparticles | 231/1e$^-$ | 25 (1) / 10(2) | 4.5-2.0, 0.2 mA cm$^{-2}$ | 118 |
| | NIB | | | | 38(1) / 10(2) | 4.0-1.5, 0.2 mA cm$^{-2}$ | |
| TiF$_3$/C | | Ball-milling | Nanoparticles (17 nm) | 768/3e$^-$ | 730(1) / 400(40) | 4.0-0.5, 38 mA g$^{-1}$ | 148,164 |
| TiF$_3$/C | | - | Commercial product (µm) | | 940(1) / 540(15) | 3.5-0.02, 0.2 mA cm$^{-2}$ | 165 |
| TiF$_3$/AB | LIB | Ball-milling | Nanoparticles | 256/1e$^-$ | 62 (1) / 52(2) | 4.5-2.0, 0.2 mA cm$^{-2}$ | 118 |
| | NIB | | | | 62(1) / 38(2) | 4.0-1.5, 0.2 mA cm$^{-2}$ | |
| VF$_3$/C | | - | Commercial product (µm) | 744/3e$^-$ | 910(1) / 500(10) | 4.3-0.02, 0.2 mA cm$^{-2}$ | 165 |
| AlF$_3$/C | | Ball-milling | Nanoparticles (50-600 nm) | 957/3e$^-$ | 790(1) / 300(12) | 4.0-0.5, 0.1C | 166 |
| VO$_2$F/C | | High pressure solid state | Microparticles | 788/3e$^-$ | 410(1) / 200(14) | 3.9-2.0, C/50 | 167,168 |
| VO$_2$F/C | | Ball-milling | Nanoparticles | | 450(1) / 215(54) | 4.1-1.3, 50 mA g$^{-1}$ | 169 |
| VO$_2$F/graphene | | Ball-milling | Nanoparticles | | 250(1) / 150(50) | 4.3-2.1, C/20 | 170 |

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|---|---|---|---|---|---|---|
| $Li_2VO_2F$/C | Ball-milling | Nanoparticles | 525/2e$^-$ | 310(1) / 250(14) | 4.5-1.3, C/20 | 171 |
| $Li_2CrO_2F$/C | Ball-milling | Nanoparticles | 521/2e$^-$ | 375(1) / 180(60) | 4.7-1.3, 13 mA g$^{-1}$ | 172 |
| $Li_2V_{1-x}Cr_xO_2F$ (x=0.5)/C | Ball-milling | Nanoparticles | 523/2e$^-$ | 360(1) / 250(60 | 4.7-1.3, 13 mA g$^{-1}$ | 172 |
| $Li_2V_{1-x}Cr_xO_2F$ (x=0.2)/Super P | Ball-milling | Nanoparticles | 525/2e$^-$ | 280(1) / 250(50) | 4.8-1.3, 13 mA g$^{-1}$ | 169,173 |
| **HTB** | | | | | | |
| $FeF_3\cdot 0.33H_2O$/C | Hydrothermal | Microparticles | 225/1e$^-$ | 190(1) / 136(30) | 4.5-2.0, 0.1C | 174 |
| $FeF_3\cdot 0.33H_2O$/C | Precipitation/IL | Nanobranchs | | 154(1) / 130(30) | 4.5-1.6, 14 mA.g$^{-1}$ | 175 |
| $FeF_3\cdot 0.33H_2O$/C | Precipitation/IL | Nano (10nm) /mesoporous | | 150(1) / 115(50) | 4.5-1.6, 0.1C | 176 |
| $FeF_3\cdot 0.33H_2O$/SWNT | Precipitation/IL | Nanoparticles | | 220(1) / 143(50) | 4.5-1.7, 0.1C | 177 |
| $FeF_3\cdot 0.33H_2O$/AB | Precipitation, ball-milling, heating | Microparticles (<1 µm) | | 129(1) / 102(100) | 4.5-2.0, 0.1C | 178 |
| $Fe_{0.95}Co_{0.05}F_3\cdot 0.33H_2O$/AB | | | | 152(1) / 140(100) | | |
| $FeF_3\cdot 0.33H_2O/FeF_3(H_2O)_2\cdot H_2O$/ACMB | Precipitation/heating | Spherical particles (30 µm) composite | - | 179(1) / 140(50) | 4.5-2.0, 23.7mA.g$^{-1}$ | 179 |
| $FeF_3\cdot 0.33H_2O$/SWNT LIB | Precipitation/IL | Nanoparticles (10-40 nm) | 225/1e$^-$ | 160(1) / 140(100) | 4.5-1.7, 0.1C | 180 |
| NIB | | | | 130(1) / 74(50) | 4.0-1.2, 0.1C | |
| $FeF_3\cdot 0.33H_2O$/C | Precipitation | Nanoparticles (2-7 nm) | 225/1e$^-$ | 180(1) / 149(100) | 4.5-2.0, 0.1C | 19 |
| | | | | 703(1) / 166(35) | 4.5-1.0, 0.1C | |
| $FeF_3\cdot 0.33H_2O$/GNS | Precipitation/IL | Nanoparticles | | 110(1) / 113(250) | 4.5-1.7, 10C | 181 |
| $FeF_3\cdot 0.33H_2O$/C | Ball-milling | Nanoparticles (25-40 nm) | | 235(1) / 150(10) | 4.5-1.8, 1C | 182 |
| $FeF_3\cdot 0.33H_2O$/C | Sovothermal/Ripening/ Calcination | Porous hollow microspheres | | 100(1) / 100(45) | 4.5-1.5, 1C | 183 |
| $FeF_3\cdot 0.33H_2O$/rGO | Sol-gel/Microwaves | Nanoparticles (30 nm) | | 270(1) / 150(55) | 4.5-1.5, C/10 | 184 |
| $FeF_3\cdot 0.33H_2O$@CMK-3 | Nanocasting | Nanocomposite/mesoporous | | 100(1) / 78(100) | 4.5-1.7, 50C | 185 |
| $FeF_3\cdot 0.33H_2O$/C | Solvothermal/Ti foil | Hierarchical 3D porous Microflower | | 126(1) / 123(50) | 4.5-1.7, 3C | 186 |
| $FeF_3\cdot 0.33H_2O$/AB | Solvothermal | Hollow prismatic/cylindric (0.5 µm) of tiny particles (50 nm) | | 160(1) – 136(100) | 4.5-2.0, 0.5C | 187 |
| $FeF_3\cdot 0.33H_2O$/C | Precipitation | Mesoporous microsphreres | | 262(1) / 174(100) | 4.5-2.0, 0.6C | 188 |
| $FeF_3\cdot 0.33H_2O$/C @CNHs | Precipitation | Mesoporous nanocomposite | | 157(1) / 154(50) | 4.5-1.7, 1C | 189 |
| $FeF_3\cdot 0.33H_2O$@GF-scCO$_2$ | scCO$_2$ assisted method | microflowers | 675/3e$^-$ | 550(1) / 145(30) | 4.5-1.4, 1C | 190 |
| $FeF_3\cdot 0.33H_2O$@CNHs | Precipitation | 3D Hierarchical nanocomposite | 225/1e$^-$ | 162(1) / 154(50) | 4.5-1.7, 1C | 189 |
| $FeF_3\cdot 0.33H_2O$/C | Precipitation | Spindle (400x200 nm) | | 158(1) / 120(10) | 4.5-1.8, 20 mAg$^{-1}$ | 21 |
| | Ball-milling | Nano (40-60 nm) | | 234(1) / 157(10) | | |
| $FeF_3\cdot 0.33H_2O$/C LIB | Solvothermal | Nano (10nm) /mesoporous | 675/3e$^-$ | 276(1) / 193(50) | 4.5-1.5, 1C | 191 |
| NIB | | | | 213(1) / 102(40) | 4.0-1.0, 1C | |

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|---|---|---|---|---|---|---|---|
| $FeF_3\cdot0.33H_2O$/rGO | | Solvothermal | Microparticles | 225/1$e^-$ | 145(1) / 100(30) | 4.0-2.0, 0.1C | 192 |
| | | | | 675/3$e^-$ | 700(1) / 165(30) | 4.0-1.0, 0.1C | |
| $FeF_3\cdot0.33H_2O$/rGO | | Ball milling/reduction | Nano/composite | | 450(1) / 166(100) | 4.3-1.3, 0.05C | 193 |
| $FeF_3\cdot0.33H_2O$/C | | Reversed micelle method | Hierarchical mesoporous nanoflowers | 225/1$e^-$ | 146(1) / 143(100) | 4.5-1.8, 5C | 194 |
| $FeF_3\cdot0.33H_2O$/PGS | | Precipitation | Nano (300 nm) | 675/3$e^-$ | 988(1) / 601(60) | 4.5-1.5, 0.5C | 195 |
| Dehydrated HTB-$FeF_3$/SWNT/C | | Ionothermal fluorination | Nanodomains (4 nm) embedded in matrix | | 700(1) / 200(100) | 4.5-1.7, 0.1C | 196 |
| HTB_$FeF_3$/SWNT | | Precipitation/IL | Nanoparticles | | 700(1) / 200(100) | 4.5-1.3, 0.1C | 196 |
| $FeF_3\cdot0.33H_2O$/C (Super P) | | Precipitation | nanocomposite | 225/1$e^-$ | 187(1) / 172(50) | 4.5-2.0, 0.1C | 197 |
| $FeF_3.0.33H_2O$@C hybrids nanoreactors | | Hydrothermal, heating | Nanoreactors (60 nm) | 675/3$e^-$ | 321(1) - 260(400) | 4.5-1.5, 100 mA.g$^{-1}$ | 198 |
| $FeF_3\cdot0.33H_2O$/Ag/SP | | Precipitation | Microparticles | 225/1$e^-$ | 168(1) / 128(50) | 4.5-2.0, 0.1C | 199 |
| $FeF_3\cdot0.33H_2O$/rGO | | Precipitation/heating | Nanocomposite | | 137(1) / 133(100) | 4.5-1.8, 2C | 200 |
| $FeF_3\cdot0.33H_2O$/C | | solvothermal | Micro/nano(30-50 nm) | | 146(1) / 150(50) | 4.5-1.7, 0.5C | 201 |
| $FeF_3\cdot0.33H_2O$/3D-OMC | NIB | Solvothermal | Microparticles | 675/3$e^-$ | 386(1) / 238(100) | 4.0-1.0, 20 mAg$^{-1}$ | 202 |
| $FeF_3\cdot0.33H_2O$/C | NIB | Solvothermal | Flowerlike mesoporous nanostructures (200 nm) | 225/1$e^-$ | 283(1) / 190(100) | 4.5-1.5, 0.1C | 203 |
| $FeF_3\cdot0.33H_2O$/C | | Solvothermal | Hollow nanospheres (150 nm) | | 87(1) / 120(100) | 4.5-1.7, 0.1C | 204 |
| $FeF_3\cdot0.33H_2O/AlPO_4$/C | NIB | Solvothermal | Hollow porous microspheres | 675/3$e^-$ | 290(1) / 211(80) | 4.0-1.2, 0.1C | 205 |
| $FeF_3\cdot0.33H_2O$/MWCT/C | NIB | Solvothermal | Spherical nanocomposites/mesoporous | | 350(1) / 123(50) | 4.5-1.5, 0.1C | 206 |
| $FeF_3\cdot0.33H_2O$/MWCT/C | | Precipitation | Nanocomposite (500-600 nm) | | 597(1) / 498(50) | 4.0-1.4, 0.6C | 207 |
| $FeF_3\cdot0.33H_2O$/CB | | Solvothermal | Nanoparticles (50 nm) | 225/1$e^-$ | 170(1) / 130(200) | 4.5-2.0, 1C | 208 |
| $FeF_3\cdot0.33H_2O$/graphitized Carbon | | Solvothermal (MOF)/thermal decomposition | Nanocomposite/porous | | 197(1) / 162(50) | 4.5-1.7, 1C | 209 |
| $FeF_3\cdot0.33H_2O$@3DPC | | Solvothermal/heating | nanocomposite | | 125(1) / 101(500) | 4.5-2.0, 5C | 210 |
| $FeF_3\cdot0.33H_2O$/C | | Precipitation | Microsphere/nanoplate | | 173(1) / 167(100) | 4.5-2.0, 20 mAg$^{-1}$ | 211 |
| $FeF_3\cdot0.33H_2O$/2DrGO | | Solvothermal | Nano/rGo composite | | 177(1) / 175(100) | 4.5-1.7, 0.5C | 212 |
| $FeF_3\cdot0.33H_2O$/CNT+graphene | | Precipitation | Nano (50-100 nm) | | 225(1) / 193(50) | 4.5-1.8, 0.2C | 213 |
| $FeF_3\cdot0.33H_2O/FeF_3$/C | | Solvothermal | Hollow Yolk-like spheres | 675/3$e^-$ | 306(1) / 164(40) | 4.2-1.5, 0.3C | 214 |
| $FeF_3\cdot0.33H_2O$/GQDs/C | | Solvothermal/Surface modification | Nanosheets | 225/1$e^-$ | 155(1) / 97(1000) | 4.5-1.7, 2C | 215 |
| $FeF_3\cdot0.33H_2O$/rGO | NIB | Reverse micelle method | Mesoporous/nanocomposite | | 227(1) / 101(00) | 4.0-1.4, 1C | 216 |
| $FeF_3\cdot0.33H_2O$/graphene/CNT | | Solvothermal/IL | Micro/Nano/porous | | 162(1) / 120(100) | 4.5-1.7, 1C | 217 |

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|---|---|---|---|---|---|---|---|
| $FeF_3\cdot0.33H_2O$@3DrGO | | Solvothermal/in-situ fluorination | Nanocomposite | | 150(1) / 100(1400) | 4.5-2.0, 1.25C | 218 |
| $FeF_3\cdot0.33H_2O$@NSPC | | Wet impregnation/Dehydration | Micro/Porous | | 184(1) / 164(100) | 4.5-2.0, 40 mA.g$^{-1}$ | 219 |
| $FeF_3\cdot0.33H_2O/C$ | | Reverse micelle method | Hierarchical nanoparticles (100 nm) | 675/3e$^-$ | 527(1) / 240(100) | 4.2-1.5, 24 mA.g$^{-1}$ | 220 |
| o-$FeF_3\cdot0.33H_2O/C$ (MIL-53) | | Solvothermal/copyrolysis | Octahedra/Porous (1µm) | 225/1e$^-$ | 212(1) / 173(100) | 4.5-1.5, 60 mA.g$^{-1}$ | 221 |
| | | | | | 150(1) / 90(1000) | 4.5-1.5, 474 mA.g$^{-1}$ | |
| s-$FeF_3\cdot0.33H_2O/C$ (MIL-53) | | | Spindles/Porous (500 nm) | | 232(1) / 147(100) | 4.5-1.5, 60 mA.g$^{-1}$ | |
| | | | | | 125(1) / 78(1000) | 4.5-1.5, 474 mA.g$^{-1}$ | |
| $FeF_3\cdot0.33H_2O/C$ | LIB | Solvothermal/ calcination | Raspberry-like 3D hierarchical microsized sphere | 675/3e$^-$ | 438(1) / 284(100) | 4.5-1.5, 0.1C | 222 |
| | NIB | | | | 228(1) / 150(100) | 4.5-1.5, 0.1C | |
| $FeF_3\cdot0.33H_2O$@CNS/SP | | Precipitation/Heat treatment | Nanocomposite | 225/1e$^-$ | 175(1) / 173(200) | 4.2-2.0, 1C | 223 |
| $FeF_3\cdot0.33H_2O$@CNS/LCNS/SP | | | | 675/3e$^-$ | 248(1) / 234(100) | 4.2-0.01, 1C | |
| $FeF_3\cdot0.33H_2O/C$ | | Solvothermal (surfactants) | Micro/Nano hierarchical particles | 225/1e$^-$ | 213(1) / 109(100) | 4.5-2.0, 1C | 224 |
| $FeF_3\cdot0.33H_2O/V_2O_5/C$ | | Precipitation | Nano/composite | | 219(1) / 192(30) | 4.5-2.0, 0.1C | 225 |
| $FeF_3\cdot0.33H_2O/MoS_2/C$ | | Precipitation | Nano/composite | | 170(1) / 141(30) | 4.5-2.0, 0.1C | 226 |
| $FeF_3\cdot0.33H_2O/C$ | | Precipitation | Microparticles | 675/3e$^-$ | 496(1) / 133(50) | 4.5-1.5, 0.1C | 227 |
| $FeF_3\cdot0.33H_2O/MoO_3/C$ | | | | | 424(1) / 216(50) | 4.5-1.5, 0.1C | |
| | | | | | 162(1) / 99(100) | 4.5-2.0, 0.1C | |
| $FeF_3\cdot0.33H_2O/Li_3FeF_6/C$ | | Precipitation | Microparticles | | 503(1) / 174(100) | 4.5-1.5, 0.2C | 228 |
| $FeF_3\cdot0.33H_2O/TiO_2/C$ | | Solvothermal | Microparticles | | 453(1) / 260(200) | 4.5-1.5, 0.2C | 229 |
| $FeF_{2.2}O_{0.4}\square_{0.4}$ | | Degradation | Microparticles | 225/1e$^-$ | 180(1) / 110(10) | 4.2-2.0, 50 mA.g$^{-1}$ | 230–232 |
| $FeF_{2.66}(OH)_{0.34}$ | | Degradation | Microparticles | | 170(1) / 110(10) | 4.0-2.0, 0.05C | 233 |
| $Fe_{0.92}Ti_{0.08}F_3\cdot0.33H_2O/C$ | | Precipitation | Nano (100 nm) | 675/3e$^-$ | 460(1) / 295(40) | 4.5-1.5, 0.1C | 234,235 |
| $Fe_{0.92}Mn_{0.08}F_3\cdot0.33H_2O/C$ | | Hydrothermal | Worm-like mesoporous structure microspheres | | 450(1) / 180(100) | 4.5-1.5, 0.2C | 236 |
| $Fe_{0.98}Mn_{0.03}F_3\cdot0.33H_2O/C$ | | Hydrothermal | Microparticles | | 284(1) / 258(550) | 4.5-1.5, 0.1C | 237 |
| $Fe_{0.947}Ni_{0.08}F_3$. $0.33H_2O/C$ | | Solvothermal | Nano/Microspheres (1µm) | | 412(1) / 264(100) | 4.5-1.5, 0.2C | 238 |
| $Fe_{0.55}V_{0.45}F_{2.67}(OH)_{0.33}/C$ | | Solvothermal (MW)/ thermal decomposition | Microparticles | 225/1e$^-$ | 181(1) / 121(10) | 4.0-2.0, 0.05C | 239 |
| **Pyrochlore** | | | | | | | |
| $Fe_{1.9}F_{4.75}\cdot0.95H_2O/C$ | | Precipitation/IL, heating | Nanoparticles | 221/1e$^-$ | 120(1) / 90(10) | 4.5-1.6, 14 mA g$^{-1}$ | 175 |
| $FeF_3\cdot0.5H_2O$/IL binder/graphene layer | | Precipitation/IL | Nanocomposite | 220/1e$^-$ | 130(1) / 115(50) | 4.5-1.7, 0.1C | 177 |
| $FeF_3\cdot0.5H_2O$/SWTN | LIB | Precipitation/IL | Microporous Nanoparticles | 221/1e$^-$ | 143(1) / 114(300) | 4.5-1.7, 0.1C | 240 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | NIB | | | $663/3e^-$ | 250(1) / 150(50) | 4.0-0.8, 0.1C | |
| $FeF_3\cdot 0.5H_2O$/SWNT(5%) | | Precipitation/IL | Porous Microspheres (1 µm) | | 575(1) / 100(18) | 4.5-1.0, 0.1C | [241] |
| $Fe_{1.9}F_{4.75}\cdot 0.95H_2O$/C | | Microwaves/IL | Mesoporous Nanospheres (300 nm) | | 300(1) / 130(100) | 4.5-1.6, 14 mA $g^{-1}$ | [242] |
| $FeF_3.xH_2O$/AC | | Precipitation, solvent exchange, heating | Porous nanospheres (<10nm) | $225/1e^-$ | 222(1) / 145(50) | 4.0-1.7, 50 mA $g^{-1}$ | [243] |
| $Fe_{1.9}F_{4.75}\cdot 0.95H_2O/FeF_3.H_20$/C | | Solvothermal/IL | Mesoporous hollow Nanospheres (500 nm) | $663/3e^-$ | 380(1) / 148(100) | 4.5-1.6, 0.1C | [244] |
| $Fe_2F_5\cdot H_2O$/graphene/C | NIB | Precipitation/IL | Nanospheres | $221/1e^-$ | 175(1) / 145(30) | 4.0-1.0, 20 mA $g^{-1}$ | [245] |
| $Fe_2F_5\cdot H_2O$/graphene/C | NIB | Precipitation/IL | Nanospheres | | 175(1) / 145(30) | 4.0-1.0, 20 mA $g^{-1}$ | [245] |
| $FeF_{2.5}\cdot 0.5H_2O$/MWCNT | | Precipitation/IL | Nanospheres (200 nm)/nanocomposite | $663/3e^-$ | 325(1) / 147(100) | 4.5-1.5, 40 mA $g^{-1}$ | [246] |
| $Fe_2F_5\cdot H_2O$/MWCNT | NIB | Precipitation/IL | Nanospheres (20 nm) | $221/1e^-$ | 127(1) / 115(50) | 4.0-1.0, 100 mA $g^{-1}$ | [247] |
| $Fe_2F_5\cdot H_2O$/rGO | NIB | Precipitation/IL | Nanocomposite | $663/3e^-$ | 249(1) / 164(100) | 4.0-1.0, 20 mA $g^{-1}$ | [248] |
| $FeF_3\cdot 0.5H_2O$/MWCNT | NIB | Precipitation/IL | Mesoporous Nanocomposite (10-100 nm) | $220/1e^-$ | 194(1) / 148(100) | 4.5-1.5, 0.05C | [249] |
| $FeF_3\cdot 0.5H_2O$/C | | Solvothermal | Microspheres (1µm) | $220/1e^-$ | 130(1) / 75(50) | 4.0-2.0, 0.1C | [250] |
| | | | | $663/3e^-$ | 630(1) / 160(30) | 3.8-1.0, 0.1C | |
| 3D $Fe_2F_5\cdot H_2O$@NPC | | Precipitation/IL | Hybrid Nanocomposite | $221/1e^-$ | 183(1) / 163(50) | 4.5-1.7, 0.5C | [251] |
| $FeF_3\cdot 0.5H_2O$/rGO | | Solvothermal | Nanospheres (5 nm) / composite | $220/1e^-$ | 223(1) / 145(100) | 4.5-2.0, 0.05C | [252] |
| $FeF_3\cdot 0.5H_2O$ /C | | Solid gaz $F_2$ reaction | Microcrystalline powder | | 200($1e^-$), 630($3e^-$) | 3.5-1.0, 20 mA.$g^{-1}$ | [158] |
| $Fe_{0.9}Co_{0.1}F_3\cdot 0.5H_2O$/C | | Precipitation/IL | Nanospheres (600 nm) | | 227(1) / 150(200) | 4.5-1.8, 0.1C | [253] |
| $Fe_{1.95}Cr_{0.05}F_5\cdot H_2O$/C | NIB | Precipitation/IL | Nano (500 nm) | | 357(1) / 171(100) | 4.0-1.0, 0.1C | [254] |
| **TTB** | | | | | | | |
| $K_{0.6}FeF_3$/KB/C | NIB | Ball-milling | Nano (100 nm) | $197/1e^-$ | 270(1) / 100(35) | 4.5-1.5, 0.1C | [255] |
| ***Amorphous*** | | | | | | | |
| (3DOM)$FeF_3$-PEDOT | | Solid template method (CCT) | Hybrid nanostructure, pores (250 nm, 20-50 nm) | $237/1e^-$ | 210(1) / 200(30) | 4.5-2.0, 20 mA.$g^{-1}$ | [256] |
| $FeF_3.0.5H_2O$/SWNT(5%) | | Precipitation/IL | Nanosheets (55 nmx1-2 µm) | $663/3e^-$ | 700(1) / 200(60) | 4.5-1.7, 0.1C | [241] |
| $FeF_3$/AC | | Gaseous fluorination, 200°C | Hierarchized macroporous/ mesoporous texture | $237/1e^-$ | 175(1) – 95(16) | 4.3-2.5, 0.05C, 60°C | [145] |

**Abbreviations**

3D-OMC Three-dimensional Order Mesoporous Carbon

3DOM-$FeF_3$ Three-dimensionally Ordered Macroporous $FeF_3$

3DPC 3D Porous Carbon

AB Acetylene Black

ACF Activated Carbon Foam

ACMB Activated Carbon Microbead

CB Carbon Black

CFC Carbon Fiber Cloth

CMK-3 Mesoporous Carbon template

CNH Carbon Nanohorn

CNS Carbon Nanosheets

CNHs Hierarchical Carbon Nanohorns

CMB Carbon MicroBubble

CNT Carbon Nanotubes

GC Graphitic Carbon

GCL Graphitic Carbon Layers

GF-sc$CO_2$ Graphene Foam – Supercritical Carbon Dioxide

GQD Graphene Quantum Dot

IL Ionic Liquid

KB Ketjen Black

LCNS Pre-lithiated Carbon Nanosheets

MHCS Mesoporous Hollow Carbon Spheres

MWCT multi-walled carbon nanotubes

NAN Nickel ammine nitrate NPC N doped Porous Carbon

NSPC N, S co-doped Porous Carbon

PAA Poly Acrylic Acid

PEDOT Poly(3,4-ethylendioxythiophene)

PFPE Perfluoropolyether

PHCNF Porous Hollow Carbon Nanofiber

PGS Porous Carbon/Graphene Sheets

rGO Reduced Graphene Oxide

SPE Solid Polymer Electrolyte

Super P

SWNT Single-Wall Carbon Nanotubes

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