Supplementary Material

# Supplementary Table 1: Typical ESW for certain electrolytes

| **Electrode material** | **Half or full cell** | **Electrolyte** | **Specific capacity** | **Columbic efficiency** | **Cycles performed** | **Capacity fade** | **Mechanism assumption** | **Reference** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TiO­2 nanotubes | Half cell | 1 M AlCl3 | 75 mA h g-1  @ 4 mA cm-2 | ~90% a | 14 | Not discussed | Intercalation into TiO2.  Speculation of Ti4+/Ti3+ redox couple | (Liu, et al., 2012) |
| TiO­2 nanotube array | Half cell | Various combinations of  NaCl + Al2(SO4)3 | 75 mA h g-1@  4 mA cm-2 | Not discussed | Not discussed | Not discussed | Ti4+/Ti3+ redox couple, speculation of Cl- assistance in Al3+ insertion | (Liu, et al., 2014) |
| TiO­2 nanosphere | Half cell | 1 M AlCl3 | 180 mA h g-1 @ 50 mA g-1 | ~90% a | 30 | 6% | Not discussed | (Kazazi, et al., 2017) |
| TiO­2 anatase nanopowder | Half cell | 1 M AlCl3 +  1 M KCl | 15.6 mA h g-1  @ 2.85 mA g-1 | 99% | 5000 | ~15%a | Speculation on pseudocapacitive behaviour of Al and TiO2 | (Holland, et al., 2018 b) |
| TiO­2 anatase nanopowder | Half cell | 1 M AlCl3 +  1 M KCl | 15 mA h g-1  @ 40 A g-1 | ~100% a | Not discussed | Not discussed | Pseudocapacitive behaviour of Al and TiO2 | (Holland, et al., 2019) |
| TiO­2 anatase nanopowder | Full cell with CuHCF positive electrode | 1 M AlCl3 +  1 M KCl | 10 mA h g−1 @20 C | ~90% | 1750 | 7% | Al3+ surface adsorption or intercalation | (Holland, et al., 2018 c, Holland, 2018 a) |
| TiO­2 Rutile nanopowder | Half cell | 1 M AlCl3 | 29.4 mA h g-1  @0.5 A g-1 | 89.8% | 50 | ~23% a | Al3+ insertion in preference to the hydrogen evolution. Different long term behaviour to anatase noted | (Zhao, et al., 2019) |
| TiO­2 graphene | Half cell | Various AlCl3 (0.01−1M)  Al2(SO4)3 (0.5 M)  Al(NO3)3 (1 M) | 50 mA h g-1  @6.25 A g-1  for  0.25 MAlCl3 electrolyte | Not discussed | 120 with 0.25 M AlCl3 electrolyte | ~50% a | Graphene minimised resistance for charge carriers in the TiO2, and enhanced insertion into electrode. Possibility of crystal phase transition of TiO2 to aluminium titanate. | (Lahan, et al., 2017) |
| graphene- TiO­2 nanocomposite | Half cell | 0.5 M AlCl3 | 54 mA h g-1  @6.25 A g-1 | Not discussed | 20 | Capacity increased during cycles | reversible crystal phase transition of TiO2 to aluminium titanate | (Lahan and Das, 2018) |
| TiO­2 anatase nanopowder | Full cell with graphene positive electrode | 1 M AlCl3 | 40 mA h g-1  @ 1 mA cm-2 | Not discussed | 1000 | ~38% a | Not discussed | (Nandi, et al., 2019) |
| T-Al (Al pre-treated with chloroaluminate melts) | Full cell with MnO2 positive electrode | 2 M Al(CF3SO3)  2 M  Al(CF3SO3)3 + 0.1 M Mn(CF3SO3)2 | 168 mA h g-1 g @100 mA g-1  100 mA h g-1  @ 500 mA g-1 | ~100%a | 40  100 | ~50%a  Not discussed | Plating and stripping of Al on surface Al ions stripped from the anode may react with electrolyte and form a complicated product rich in Al and electrolyte components. | (Zhao, et al., 2018) |
| T-Al | Full cell with Birnessite MnO2 positive electrode | 2 M (Al(OTF)3)  2 M (Al(OTF)3) + 0.5 M MnSO4 | 350 mA h g-1  @100 mA g-1  554 mA h g-1  @ 100 mA g-1 | Not discussed | 30  65 | 88%  42% | Plating and stripping of Al on the surface | (He, et al., 2019) |
| T-Al | Full cell with MnO2 positive electrode | 5 M (Al(OTF)3) | 467 mA h g-1@ 0.01 mA cm-1 | ~80%a | 65 | ~42% a | Plating and stripping of Al on the surface | (Wu, et al., 2019) |
| Al foil | Full cell with Bi2O3 positive electrode | 1 M AlCl3 | 103 mAhg−1 @ 0.5 Ag-1 | 99% | 70 |  | Not discussed for Al | (Nandi and Das, 2020) |
| MoO3 | Half cell | 1 M Al(NO3)3 | 308 mA h g-1  @ 1 A g-1  232 mA h g-1  @ 8 mA g-1 | Not discussed | Not discussed | Not discussed | Reversible intercalation of Al3+ between MoO3 nanobelts | (Wang, et al., 2020) |
| MoO3 | Full cell with VOPO4 positive electrode | Gelatin-polyacryylamide hydrogel | 88 mA h g-1  @ 6 A g-1 | ~100%a | 2800  @ 1 A g-1 | 13.8% | As above | (Wang, et al., 2020) |
| MoO3 | Half cell | 1 M AlCl3 | 680 mA h g-1  @ 2.5 A g-1 | ~99%a | 350 | ~75%a | Reversible diffusion-controlled intercalation, with high Al3+ trapping in the first cycle | (Lahan and Das, 2019) |
| MoO3 nanowire | Half cell | 1 M AlCl3 | 300 mA h g-1  @ 3 A g-1 | ~89% | 400 | ~10% | Hexagonal crystal structure of electrode allows easy intercalation. Redox pair Mo6+/Mo5+ and Mo5+/Mo4+ | (Joseph, et al., 2019) |
| Al | Full cell with V2O5 positive elctrode | 2 M Al(OTF)3 | 186 mA h g-1  @ 40 mA g-1 | Not discussed | 50 | 89%  (35% with Nafion barrier on V2O5 electrode) | Not discussed for Al | (Zhao, et al., 2020) |
| Ppy coated MoO3 | Full cell with CuHCF positive electrode | PVA- Al(NO3)3 hydrogel | ~30 mA h g-1 @ 200 mA g-1 | Not discussed | 100 | 16.8% | Not discussed | (Wang, et al., 2019) |
| Al foil | Full cell with KNCHF positive electrode | 5 M Al(CF3SO3)5 | 46.5 mA h g-1 @ 20 mA g-1 | ~100%a | 500 | ~43%a | Plating and stripping, with Ni acting as a catalyst to create an unstable interface | (Gao, et al., 2020) |
| Zn-Al alloy | Full cell with MnO2 positive electrode | 2 M Al(OTF)3 | ~700a mA h g-1  @ 100 mA g-1 | ~100%a | 80 | ~35%a | Plating and stripping of Al, Zn substrate providing protection from passivation layer growth and Al providing shielding from Zn dendrite growth. | (Yan, et al., 2020) |
| Ti-deficient TiO2 Rutile | Half cell | 1 M AlCl­3 | 143.1 mA h g-1  @ 0.5 A g-1  78 mA h g-1  @ 3 A g-1 | 70%a | 110 | 18% | Al3+ ions can reversibly insert into Ti vacancies in the lattice | (Wu, et al., 2021) |
| Organic Anthraquinone | Full cell with CuHCF positive electrode | 1 M Al2(SO4)3 | 53.2 mAh g−1 @ 500 mA g−1 | 99% | 100 | 10.9% | Enolization (an organic process) and ion-pairing charge storage mechanism of the electrode is a diffusion-controlled process, and the spaces between molecules in the crystal lattice is beneficial for protons and Al3+ diffusion | **(Yan, et al., 2021)** |
| MoTaOx nanotubes | Half cell | 0.5 M Al2(SO4)3 | 337 mAh g−1 @ 350 mA g−1 | 99%a | 3000 | 17% | Nanotubes create a porous structure so Al3+ can intercalate/de-intercalate without damaging the structure | **(Jin, et al., 2021)** |
| a values estimated from graph data | | | | | | | | |

# Supplementary Table 2: Negative electrode material choices and mechanism assumptions

| **Electrode material** | **Half or full cell** | **Electrolyte** | **Initial specific capacity** | **Columbic efficiency** | **Cycles performed** | **Capacity fade** | **Mechanism assumption** | **Reference** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Vanadium pentoxide xerogel (xero- V2O5) | Half cell | 1 M AlCl3 | 120 mA h g-1 @ 60 mA g-1 | Not discussed | 12 | ~38%a | Al ions and water molecules co-intercalate into V2O5. Proton exchange in the V2O5 interlayers may also be occurring. This is a diffusion-controlled process. | **(González, et al., 2016)** |
| FeVO4 nanorods | Half cell | 1 M AlCl 3 +ammonium hydroxide | ~350 mA h g-1 @ 60 mA g-1 | Not discussed | 20 | ~85%a | Complex reversible Al3+ insertion/reaction mechanism and poor insertion kinetics. Converting lattice of electrode | **(Kumar, et al., 2019)** |
| Bronze-type vanadium oxide (VO2 – B) holey nanobelts | Half cell | 5 M Al(TOf)3 | 234 mA h g-1 @ 150 mA g-1 | ~100%a | 1000  @ 1 A g-1 | 22.8% | H+ and Al3+ co-intercalation | **(Cai, et al., 2020)** |
| Vanadium Phosphate (VOPO4) | Half cell | 1 M Al(NO3)3 | 115 mA h g-1 @ 1A g-1  64mA h g-1  @ 6 A g-1 | Not discussed | Not discussed | Not discussed | Intercalation of Al3+ accompanied by V5+/V4+ and V4+/V3+ reduction | **(Wang, et al., 2020)** |
| Vanadium Phosphate (VOPO4) | Full cell with MoO3 negative electrode | Gelatin-polyacryylamide hydrogel | 88 mA h g-1  @ 6 A g-1 | ~100%a | 2800 @  1 A g-1 | 13.8% | as above | **(Wang, et al., 2020)** |
| V2O5 nanorods | Full cell with Al negative electrode | 2 M Al(TOf)3 | 186 mA h g-1 @ 40 mA g-1 | ~74%a  (~100%a with Nafion barrier) | 50 | 89%  (35% with Nafion barrier) | Al reacting at the surface while protons intercalate into the electrode | **(Zhao, et al., 2020)** |
| CuHCF | Half cell | 1 M AlCl3 +  1 M KCl | 35 mA h g-1 @ 1 A g-1 | ~100% | 28000 | ~25% with various current densities | Not fully discussed, but suggestions of Fe dissolution into electrolyte. | **(Holland, et al., 2018 d)** |
| CuHCF | Full Cell with TiO2 negative electrode | 1 M AlCl3 +  1 M KCl | 10 mA h g-1 @ 333 mA g-1 | ~90% | 1750 | 7% | Discussion of K+ intercalation alongside Al3+ | **(Holland, et al., 2018 c)** |
| CuHCF nanoparticles | Half cell | 0.5 M Al2(SO4)3 | 75.75 mA h g-1 @ 50 mA g-1 | Not discussed | 400 @  400 mA g-1 | 25.6% | Reduction of Fe3+ to Fe2+ was observed during discharge both in K and non K containing nanoparticles | **(Parvizi and Kazazi, 2018)** |
| CuHCF | Half cell  Full cell with MoO3 negative electrode | 1 M Al(NO3)3  PVA- Al(NO3)3 hydrogel | 50 mA h g-1 @ 500 mA g-1  ~30 mA h g-1 @ 200 mA g-1 | Not discussed  Not discussed | Not discussed  100 | Not discussed  16.8% | Reduction of Fe3+ to Fe2+ was observed during discharge | **(Wang, et al., 2019)** |
| FeFe(CN)6 | Half cell | 5 M Al(OTF)3 (WISE) | 116 mA h g-1 @ 150 mA g-1 | 99% | 100 | 39% | Primarily Al3+ intercalation, suggests there may also be some K+ and proton insertion | **(Zhou, et al., 2019)** |
| K2CoFe(CN)6 | Half cell | 1 M Al(NO3)3 | 50 mA h g-1 @ 0.1 A g-1 | ~95% | 1600 | 24% | Al3+ intercalation, and redox couples of Co3+/Co2+ and Fe3+/Fe2+ | **(Ru, et al., 2020)** |
| KNHCF | Full cell with Al foil | 5 M Al(CF3SO3)5 | 46.5 mA h g-1 @ 20 mA g-1 | ~100% | 500 | ~43%a | Al3+ intercalation, and redox couples of Ni3+/Ni2+ and Fe3+/Fe2+ | **(Gao, et al., 2020)** |
| MnO2 | Full cell with T-Al negative electrode | 2 M Al(CF3SO3)  2 M  Al(CF3SO3)3 + 0.1 M Mn(CF3SO3)2 | 168 mA h g-1 g @100 mA g-1  100 mA h g-1  @ 500 mA g-1 | ~100%a | 40  100 | ~50%a  Not discussed | Two phase reaction with soluble Al phase forming on surface of electrode, along with an amorphous MnO2 layer | **(Zhao, et al., 2018)** |
| Birnessite MnO2 | Full cell with T-Al negative electrode | 2M Al(OTF)3 + 0.5 M MnSO4 | 554 mA h g-1  @ 100 mA g-1 | ~100%a | 65 | 42% | Three step process, Mn2+ dissolves into electrolyte on first discharge, on first charge forms layer with Al on electrode surface and this is then reversibly deposited/stripped over subsequent charges. | **(He, et al., 2019)** |
| Cryptomelane MnO2 nanowires | Half cell | 1 M Al(NO3)3 | 109 mA h g-1  @ 20 mA g-1 | Not discussed | 60 | 38% | Al3+ intercalation, replacing the K-ions within the lattice, and Mn4+/Mn3+, Mn3+/Mn2+ redox pairs within the cathode. No structural changes of the nanowires. | **(Joseph, et al., 2019)** |
| Magnesium doped MnO2 nanorods | Half cell | 1 M Al(NO3)3 | Not discussed | Not discussed | Not discussed | Not discussed | Diffusion controlled Al insertion, Mn4+/Mn3+, Mn3+/Mn2+ redox pairs, as well as surface pseudocapacitive storage | **(Joseph, et al., 2020)** |
| Mn3O4 | Full cell with Al negative electrode | 5 M Al(OTF)3 (WISE) | 467 mA h g-1@ 0.01 mA cm-1 | ~80%a | 65 | ~42% | Dissolution of Mn2+ into electrolyte and formation of amorphous layer alongside Al3+ intercalation | **(Wu, et al., 2019)** |
| MnO2 | Full cell with Zn-Al negative electrode | 2 M Al(OTF)3 | ~700a mA h g-1  @ 100 mA g-1 | ~100%a | 80 | ~35%a | Al3+ intercalation and redox reactions of Mn4+/Mn3+, Mn3+/Mn2+ | **(Yan, et al., 2020)** |
| Graphite from 4B pencil sketch | Full cell withTiO2 negative electrode | 1 M AlCl3 | 40 mA h g-1  @ 1 mA cm-2 | Not discussed | 1000 | ~38%a | Al3+ insertion/extraction, expansion of graphite interlayers during this process resulting in cracking of the electrode. | **(Nandi, et al., 2019)** |
| Graphite with carbon nano particle deposition | Half cell | 1 M AlCl3 | 157 mA h g-1  @ 1A g-1 | Not discussed | 3500 @  50 A g-1 | ~0% | Capacitive surface storage | **(Mohanapriya and Jha, 2019)** |
| Bi2O3 | Full cell with Al negative electrode | 1 M AlCl3 | 1130 mA h g-1  @ 1.5 A g-1 | ~99%a | 70 | ~98%a | Alloying between Al-Bi, and interfacial charge separation – pseudo capacitive storage. | **(Nandi and Das, 2020)** |
| WO3 | Half cell | 1 M AlCl3  0.5 M Al2(SO4)3 | ~100 mA h g-1  @ 1.5 A g-1  ~90 mA h g-1  @ 1.5 A g-1 | <80%  ~80% | 100  100 | Increased capacity to 210 mA h g-1  Increased capacity to 185 mA h g-1 | Intercalation of Al3+ | **(Lahan and Das, 2019)** |
| Na3V2(PO4)3 | Half cell | 0.1 M AlCl3 | 120 mA h g-1  @ 60 mA g-1 | Not discussed | 20 | ~50%a | Combination of surface capacitive storage and intercalation of Al3+ | **(Nacimiento, et al., 2018)** |
| macrocyclic calix[4]quinone (C4Q) | Half cell | 1 M Al(OTF)3 | 300 mAh g−1 @ 800 mA g−1 | 98% | 50 | 19% @ room temperature  18% @ -20°C | Al(OTF)2+ cation acts as the active ion to reversibly combine  with quinone cathode | **(Li, et al., 2021)** |
| Organic compound containing Phenazine (PZ) | Half cell | 5 M Al(OTF)3 | 132 mAh g−1 @ 50 mA g−1  41 mAh g−1 @ 200 mA g−1 | 90%a | 300 | 23.5% | PZ  undergoes a reversible redox reaction of -C=N- with Al-  (OTF)2+ co-intercalation transfer process | **(Chen, et al., 2021)** |
| FeFe(CN)­6 | Full cell with pre-treated Al negative electrode | 1 M Al(OTF)3 | 85 mAh g−1 @ 100 mA g−1 | 97.1% | 150 | 29% | It is speculated that the ion insertion mechanism of this cathode in the aqueous solution is accomplished in two steps | **(Bai, et al., 2021)** |
| VOPO­­4 | Half cell | Al(CF3SO3)3 | 125.4 mAh g−1 @ 20 mA g−1 | ~90%a | 40 | 40% | Reversible intercalation of Al3+ into electrode, but potential damage to structure resulting in capacity fade | **(Pang, et al., 2021)** |
| CuHCF | Full cell with Anthraquinone negative electrode | 1 M Al2(SO4)3 | 53.2 mAh g−1 @ 500 mA g−1 | 99% | 100 | 10.9% | K+ removal on first charge and subsequent Al3+ insertion/extraction on subsequent charges | **(Yan, et al., 2021)** |
| Organic tetrachloro-1,4-benzoquinone | Half cell | 1 M Al(OTf)2 | 147 mAh g−1 @ 200 mA g−1 | 100%a | 200 | 29.3% | Combination of chemical conversion of electrode from carbonyl to hydroxyl groups and the Al3+ insertion/de-insertion process | **(Jin, et al., 2021, He, et al., 2021)** |
| a values estimated from graph data | | | | | | | | |

# Supplementary Table 3: Positive electrode material choices and mechanism assumptions

| **Anode material** | **Cathode membrane material** | **Electrolyte** | **Specific capacity** | **Energy density** | **OCV** | **Comments** | **Ref** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Nano-yttrium-stabilised-zirconium-aluminium alloy (nano-YSZ 5% wt) | Stainless steel mesh | 1 M KOH | 882 mAh g-1 @ 2 mA cm-2  14.25 hrs discharge time | Not given | 1.44 V | Corrosion resistance, potential protective layer due to Z4+ on anode, increasing capacity and OCV | (Palanisamy, et al., 2020) |
| Al-Mn-Sb | MnO2­/C catalyst layer | 4 M KOH | 2797 mAh g-1 @ 120 mA cm-2 | 1854 m  Wh g-1 @ 120 mA cm-2 | 1.89 V | Increased corrosion resistance inhibits HER side reactions. | (Liu, et al., 2020) |
| Al 7075-T7351 alloy | Not discussed | 4 M NaOH | 2777 mAh g-1 @ 50 mA cm-2 | Not given | 1.47 V | Increased corrosion resistance due to Cu presence in alloy. | (Mutlu, et al., 2017) |
| Al 99.9% purity | Nickel foam, pourous PTFE and a Ag doped LAM catalytic layer | 4 M KOH | Not given | Not given | Not given |  | (Xue, et al., 2017) |
| Al 99.9% purity | Carbon particles, nano-manganese catalyst, nickel mesh | 4 M NaOH + 0.05 M Na2SnO3 | 2.697 Ah g-1 @ 150 mA cm-2 | 900 Wh kg-1 | 1.22 V | Flow battery with oil displacing electrolyte when battery not in use. This reduced open circuit corrosion | (Hopkins, et al., 2018) |
| Al 6061 alloy | Nickel foam and silver manganate nanoplate catalyst | 6M KOH | 2843 Ah g-1 @ 100 mA cm-2  7.3 hrs discharge time | ~2552 Wh kg-1 @ 100 mA cm-2 | ~1.42 V | Flow battery, with catalyst promoting ORR at cathode | (Ryu, et al., 2018) |
| Aluminium plate | Carbon paper | NaAlO2 | 51.61 mAh cm-2  (no current density given)  87 hrs discharge time | Not given | ~1.27 V | Demonstrating use of NaAlO2 electrolyte | (Takeda and Taguchi, 2018) |
| Al nanoparticles on Al film | Pt/C on carbon paper | 2 M KOH gel | 50.18 mAh g-1 @ 0.5 mA cm-2 | Not given | Not given | Demonstrating 3D printed anode | (Yu, et al., 2018) |
| Al-Sb | MnO2/C | 4 M KOH | 2317 Ah kg-1 @ 20 mA cm-2 | 3871 Wh kg-1 @ 20 mA cm-2 | 1.881 V | Al-Sb precipitates help inhibit self-corrosion of the anode, and slows the rate of a passive film growth on the surface | (Liu, et al., 2019) |
| Cu electrodeposited on Al | Not given | 1 M NaOH | Not given | Not given | 1.365 V (discharge) |  | (Mutlu and Yazıcı, 2019) |
| Al 0.5-Mg 0.1-Sn 0.05 In (wt%) | MnO2 catalyst | 4 M NaOH | 2773 Ah kg-1 @ 80 mA cm-2 | 3217 Wh kg-1 @ 80 mA cm-2 | 1.196 V (discharge) | Indium reduces HER and increases anode efficiency | (Wu, et al., 2019) |
| Al-0.02Sb (wt%), heat treated for 3 hours at 550°C | MnO2/C catalyst | 4 M KOH | 2758 Ah kg-1 @ 20 mA cm-2 | 3776 Wh kg-1 @ 20 mA cm-2 | 1.89 V | Long heat treatment increases Al-Sb precipitate grain growth and coarsening which worsens performance. 3 hrs was optimum performance. | (Zhang, et al., 2019) |
| Al-6061 alloy | Carbon black coated carbon cloth, with MnO2 catalyst | 2 M KOH | Not given | 5.5 mWh cm-2 @ 5 mA cm-2 | ~1.4 V | Reduction reactions at a higher potential and lowered charge transfer resistance due to electrocatalyst. | (Katsoufis, et al., 2020) |
| Al-foil | Co3O4 nanosheets on N-doped carbon nanotubes and 3D graphene | 2 M KOH | 482 mAh g-1 @ 1 mA cm-2 | Not given | 1.52 V | Demonstrating binder free cathode with reliable performance | (Liu, et al., 2020) |
| Al sheet 99.9% wt purity | Nickel foam, MnO2/C catalyst | Dual electrolyte  Aqueous catholyte : polymer gel with 3 M KOH  Non-aqueous anolyte: methanol solution with 3 M KOH | 2328 mAh g-1 @ 10 mA cm-2  ~40 hours dicharge | Not given | 1.44 V | Reduced corrosion of anode using non-aqueous anolyte significantly enhances the capacity and anode utilisation | (Teabnamang, et al., 2020) |
| Al alloy | MnxOy/Ag | 4 M KOH + 0.05 M K2SnO­3 + 2 Mm apg | 2180 mAh g-1 @  100 mA cm-2 | Not given | 1.783 V | Addition of 0.05 M K2SnO­3 + 2 Mm APG inhibits corrosion of anode through protective uniform Sn layer, increases capacity. | (Wu, et al., 2020) |
| Al-Sb | MnO2/C catalyst | 4 M KOH | 2859 Ah kg-1 @ 40 mA cm-2 | 3547 Wh kg-1 @ 40 mA cm-2 | ~1.85 V | Rolling process to create anode and refine grains of Al-Sb | (Zhang, et al., 2020) |
| Pure Al (99.998%wt) | Pt/C | Dual electrolyte  Aqueous catholyte : saline hydrogel (XaKCl)  Non-aqueous anolyte: acidic PVA membrane with 5 MHCl | 50 μAh g-1 @  100 μA cm-2 | Not given | ~ 1.66 V |  | (Gaele, et al., 2021) |
| Al1085-Carbon Black  Al7475-Carbon Black | Ni mesh with MnO2/C catalyst | 2 M NaCl | 740 mAh g-1 @  6 mA cm-2  ~27 hrs discharge  1210 mAh g-1 @  10 mA cm-2  ~34 hrs discharge | Not given | Not given | Carbon black coating increases lifetime and capacity of cell by increasing anode utilisation | (Pino, et al., 2016) |
| Al foil 99.998%wt purity | Ni foam with Pt catalyst | Hydrogel 8 M KOH with κ-carrageenan | 53 mAh cm-2 @10 mA cm-2  ~5 hrs discharge | 33 mWh cm-2 @10 mA cm-2 |  | Granularity of the hydrogel plays a key role in capacity and lifetime of the cell | (Di Palma, et al., 2017) |
| Al–1.5Bi–1.5Pb–0.035Ga | MnO2 | 2 M NaCl  4 M KOH | 2048 mAh g-1 @  25 mA cm-2  2559 mAh g-1 @  100 mA cm-2 | 2244 mWh g-1  @  25 mA cm-2  3058 mW g-1  @  100 mA cm-2 | 1.43 V  1.60 V | Anode alloy has a more negative potential than other anodes tested. In NaCl due to adsorption of Cl-. In KOH limits self corrosion | (Wang, et al., 2017) |
| Aluminium plate | Ni foam with Fe-N-C catalyst | 6 M KOH + corrosion inhibitors | 300 mA cm-2 @  100 mA cm-2 | Not given | 1.74 V | Use of Fe-N-C catalyst comparable to Pt/C | (Wang, et al., 2018) |
| Al plate | Cu-Fe-N-C Catalyst | 6 M NaOH | Not given | Not given | Not given | ORR speed increased with Cu-Fe-N-C catalyst compared to Fe-N-C | (Li, et al., 2019) |