What is claimed is:

1. A battery, comprising:

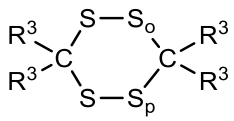
a) an anode comprising an anode active material comprising sodium, lithium or an alloy or composite of at least one of sodium or lithium with at least one other metal for providing ions;

b) a cathode comprising a cathode active material comprising elemental sulfur, elemental selenium or a mixture of elemental chalcogens; and

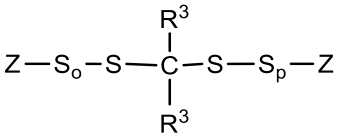
c) an intermediate separator element positioned between the anode and cathode acting to separate liquid or gel electrolyte solutions in contact with the anode and cathode, through which metal ions and their counterions move between the anode and cathode during charge and discharge cycles of the battery;

wherein the cathode comprises at least one organosulfur species; comprising at least one organic moiety and at least one $–S-S_n-$ linkage, n being an integer of 1 or more, said organosulfur species containing one or more sulfur-containing functional groups selected from the group consisting of dithioacetal, dithioketal, trithio-orthocarboxylate, aromatic polysulfide, organo- polysulfide containing trithiocarbonate functionality and organo-metal polysulfide containing trithiocarbonate functionality.

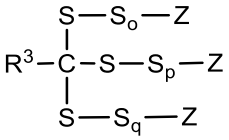
2. The battery of claim 1, wherein the organosulfur species is a dithioacetal or dithioketal of formulas (I) or (II), or a trithio-orthocarboxylate of formula (III):



I



II



III

wherein each R^3 is independently H or a C_1-C_{20} organic moiety that may be linear, branched, or cyclic aliphatic or aromatic and that may optionally comprise one or more functional groups containing N, O, P, S, Se, Si, Sn, halogen and/or metal, o, p and q are each independently an integer of 1 or more, and each Z is independently: a C_1-C_{20} organic moiety that may be linear, branched, or cyclic aliphatic or aromatic and that may optionally comprise one or more functional groups containing N, O, P, S, Se, Si, Sn, halogen and/or metal; Li; Na; quaternary ammonium; or quaternary phosphonium.

3. The battery of claim 1, wherein the cathode is additionally comprised of at least one electrically conductive additive and/or at least one binder.

4. A cathode comprising a) elemental sulfur, elemental selenium or a mixture of elemental chalcogens, b) at least one electrically conductive additive, c) and at least one organosulfur species comprising at least one organic moiety and at least one –S-S_n- linkage, n being an integer of 1 or more, said organosulfur species containing one or more sulfur-containing functional groups selected from the group consisting of dithioacetal, dithioketal, trithio-orthocarboxylate, aromatic polysulfide, organo- polysulfide containing trithiocarbonate functionality and organo-metal polysulfide containing trithiocarbonate functionality.

5. The cathode of claim 4, in combination with a current collector.

6. The cathode of claim 4, wherein the at least one electrode conductivity enhancing agent includes graphite, carbon nanotubes, carbon nanofibers, graphene, carbon black or soot.

7. The cathode of claim 4, additionally comprising at least one binder.