Claims

1. Organic lithium battery comprising:

- a negative electrode comprising lithium metal or an alloy of lithium metal,

- a positive electrode optionally supported by a current collector, said positive electrode comprising at least one redox organic structure comprising at least two carbonyl C=0 functional groups, two thione C=S functional groups or two imine C=N functional groups, at least one polymer binder P_1 and at least one agent generating electron conductivity, said redox organic structure being different from the sulphur-comprising agents chosen from elemental sulphur S_8 and sulphur-comprising organic compounds comprising at least one S-S bond,

said organic lithium battery being characterized in that it additionally comprises an electrolyte comprising at least one lithium salt L_1 and at least one liquid linear or cyclic polyether with a molar mass of less than or equal to 10 000 $g \cdot mol^{-1}$, it being understood that:

* when the electrolyte is a liquid electrolyte, the concentration of lithium salt L_1 in said liquid electrolyte is at least 1.6 mol/l, and the liquid electrolyte impregnates a porous separator, and

* when the electrolyte is a gelled polymer electrolyte, it additionally comprises at least one polymer binder P_2 which is soluble in the liquid linear or cyclic polyether with a molar mass of less than or equal to 10 000 $g \cdot mol^{-1}$, and the concentration of lithium salt L_1 in said gelled polymer electrolyte is such that the O/Li ratio is at most 15, it being understood that, in the O/Li ratio, "O" denotes the number of oxygen atoms provided by the ether units of the liquid linear or cyclic polyether with a molar mass of less than or equal to 10 000 $g \cdot mol^{-1}$, and optionally by the ether units of the polymer binder P_2, if it contains them, and "Li" denotes the number of lithium ions provided by the lithium salt L_1.

2. Battery according to Claim 1, characterized in that the lithium salt L_1 is chosen from lithium fluorate ($LiFO_3$), lithium bis(trifluoromethanesulphonyl)imide (LiTFSI), lithium hexafluorophosphate ($LiPF_6$), lithium fluoroborate ($LiBF_4$), lithium metaborate ($LiBO_2$), lithium perchlorate ($LiClO_4$), lithium nitrate ($LiNO_3$), lithium bis(fluorosulphonyl)imide (LiFSI), lithium bis(oxalato)borate ($LiB(C_2O_4)_2$ or LiBOB) and their mixtures.

3. Battery according to either one of the preceding claims, characterized in that the positive electrode comprises at least 50% by weight of redox organic structure, with respect to the total weight of said positive electrode.

4. Battery according to any one of the preceding claims, characterized in that the positive electrode comprises from 1 to 30% by weight of agent generating an electron conductivity, with respect to the total weight of the positive electrode.

5. Battery according to any one of the preceding claims, characterized in that the agent generating an electron conductivity is chosen from carbon black, carbon SP, acetylene black, carbon fibres and nanofibres, carbon nanotubes, graphene, graphite, metal particles and fibres, and one of their mixtures.

6. Battery according to any one of the preceding claims, characterized in that the positive electrode comprises from 2 to 30% by weight of polymer binder P_1, with respect to the total weight of the positive electrode.

7. Battery according to any one of the preceding claims, characterized in that the polymer binder P_1 is chosen from copolymers and homopolymers of ethylene; copolymers and homopolymers of propylene; homopolymers and copolymers of ethylene oxide, of methylene oxide, of propylene oxide, of epichlorohydrin or of allyl glycidyl ether, and their mixtures; halogenated polymers; polyacrylates; polyalcohols; electron-conducting polymers; polymers of cationic type; and one of their mixtures.

8. Battery according to any one of the preceding claims, characterized in that the electrolyte is a gelled polymer electrolyte and the polymer binder P_2 is chosen from polyolefins, polymers comprising several ether units, halogenated polymers, non-electron-conducting polymers of anionic type, polyacrylates, elastomers and one of their mixtures.

9. Battery according to any one of the preceding claims, characterized in that the electrolyte is a gelled polymer electrolyte and the gelled polymer electrolyte comprises from 40 to 80% by weight of polymer binder P_2, with respect to the total weight of the gelled polymer electrolyte.

10. Battery according to any one of the preceding claims, characterized in that the the electrolyte is a gelled polymer electrolyte and the polymer binder P_2 is a mixture of a polymer $P_{2\text{-}A}$ and of a polymer $P_{2\text{-}B}$, said polymer $P_{2\text{-}A}$ making it possible to dissolve the lithium salt L_1 present in a high concentration in the gelled polymer electrolyte and said polymer $P_{2\text{-}B}$ making it possible to provide the mechanical strength of said gelled polymer electrolyte.

11. Battery according to Claim 10, characterized in that the polymer $P_{2\text{-}A}$ is a polymer comprising several ether units and the polymer $P_{2\text{-}B}$ is a halogenated polymer.

12. Battery according to any one of the preceding claims, characterized in that the electrolyte is a gelled polymer electrolyte and the O/Li ratio of the gelled polymer electrolyte ranges from 3 to 10.

13. Battery according to any one of the preceding claims, characterized in that the electrolyte is a gelled polymer electrolyte and the gelled polymer electrolyte comprises from 1 to 35% by weight of liquid linear or cyclic polyether, with respect to the total weight of the gelled polymer electrolyte.

14. Battery according to any one of Claims 1 to 7, characterized in that the concentration of the lithium salt L_1 in the liquid electrolyte ranges from 1.8 to 6 mol/l.

15. Process for the manufacture of an organic lithium battery as defined in any one of Claims 1 to 14, characterized in that it comprises the following stages:

A) a stage of preparation of a liquid electrolyte or of a gelled polymer electrolyte as defined in any one of Claims 1 to 14,

said process additionally comprising one or other of the following sequences B1 or B2:

B1) a stage of assembling a positive electrode, a negative electrode, as are defined in any one of Claims 1 to 14, and a gelled polymer electrolyte prepared in stage A), or

B2-i) a stage of assembling a positive electrode, a negative electrode and a porous separator, as are defined in any one of Claims 1 to 14, and

B2-ii) a stage of impregnation of the assembly as obtained in stage B2-i) by the liquid electrolyte prepared in stage A).