CLAIMS

1. A battery (100) comprising at least one anode (3) and at least one cathode (1), arranged on top of one another in an alternating manner, said battery (100) comprising lateral edges (101, 102) comprising an anode connection area and a cathode connection area, laterally opposite the anode connection area, and longitudinal edges (103, 104), in which the anode (3) comprises
- a current collector substrate,
- at least one anode layer, and
- optionally a layer of an electrolyte material or of a separator impregnated with an electrolyte,
and the cathode (1) comprises:
- a current collector substrate,
- at least one cathode layer, and
- optionally a layer of an electrolyte material or of a separator impregnated with an electrolyte,
so that the battery comprises successively at least one anode layer, at least one layer of an electrolyte material or of a separator impregnated with an electrolyte, and at least one cathode layer,
characterized in that each anode and each cathode comprises a respective main body (111, 131), separated from a respective secondary body (112, 132) by a space (113, 133) free from any electrode material and current-collector substrate, said free space connecting the opposite longitudinal edges (103, 104) of the battery.

2. The battery according to claim 1, characterized in that said free space is free of any material.

3. The battery according to claim 1 or claim 2, characterized in that said free space is empty.

4. The battery according to any one of claims 1 to 3, characterized in that, in plan view, the free spaces of the cathodes are superimposed.

5. The battery according to any one of claims 1 to 4, characterized in that, in plan view, the free spaces of the anodes are superimposed.

6. The battery according to any one of claims 1 to 5, characterized in that, in plan view, the free spaces of the cathodes and of the anodes are not coincident.

7. The battery according to any one of claims 1 to 6, characterized in that free faces of the secondary bodies respectively of the cathodes (112') and of the anodes (132'), which are opposite to the free space, fit flush with the free faces of the main body respectively of the anodes (131') and of the cathodes (111').

8. The battery according to any one of claims 1 to 7, characterized in that it comprises an encapsulation system totally covering four of the six faces of said battery, the remaining two faces comprising an anode connection area and a cathode connection area.

9. The battery according to claim 8, characterized in that the encapsulation system comprises:
- at least one first covering layer, preferably selected from parylene, type-F parylene, polyimide, epoxy resins,

silicone, polyamide, sol-gel silica, organic silica and/or a mixture thereof, deposited on the battery,

- at least one second covering layer composed of an electrically insulating material, deposited by deposition of atomic layers on said at least one first covering layer, on the understanding that this sequence of at least one first covering layer and of at least one second covering layer may be repeated z times with $z \geq 1$.

10. The battery according to any one of claims 1 to 9, characterized in that the anode connection area and the cathode connection area are covered by a termination system.

11. The battery according to claim 10, characterized in that the termination system comprises successively:

- a first layer of a material filled with graphite, preferably based on an epoxy resin filled with graphite,
- a second dense layer of metallic copper arranged on the first layer of the termination system, and
- optionally, a third layer based on a tin-zinc alloy of tin, arranged on the second layer,
- optionally a fourth layer based on tin or based on an alloy of silver, palladium and copper, arranged on the third layer of the termination system.

12. The battery according to any one of claims 1 to 11, characterized in that the width of the free space ($L_{113}$) is between 0.01 mm and 0.5 mm.

13. The battery according to any one of claims 1 to 12, characterized in that the width of the secondary bodies ($L_{112}$) is between 0.05 mm and 2 mm.

14. A method for manufacturing a battery, said battery comprising at least one anode (3) and at least one cathode (1), disposed one above the other in an alternating manner, said battery (100) comprising longitudinal edges (103, 104) and lateral edges (101, 102), in which the anode (3) comprises:

- a current collector substrate,
- at least one anode layer, and
- optionally a layer of an electrolyte material or of a separator impregnated with an electrolyte,

and the cathode comprises:

- a current collector substrate,
- at least one cathode layer, and
- optionally a layer of an electrolyte material or of a separator impregnated with an electrolyte,

so that the battery comprises successively at least one anode layer, at least one layer of an electrolyte material or of a separator impregnated with an electrolyte, and at least one cathode layer,

each anode (3) comprising an anode connection area, located in the vicinity of the first lateral edge of the battery, whereas each cathode (1) comprises a cathode connection area, situated on a second lateral edge of the battery, opposite to said first edge,

said manufacturing method comprising:

a) the provision of a stack (1) of alternating sheets, this stack comprising first sheets or anode sheets, each of which is intended to form an anode layer of a plurality of batteries, as well as second sheets or cathode sheets, each of which is intended to form a cathode layer of a plurality of batteries,

each anode sheet comprising at least one anode slot (34) and each cathode sheet comprising at least one cathode slot (14), said slot, respectively anode and cathode, comprising two longitudinal parts (16, 36) at least partly superimposed, intended to delimit the longitudinal edges (103, 104) of the battery, as well as a lateral part (18, 38) connecting said two longitudinal parts, the lateral part of the anode slot (38) and the lateral part of the cathode slot (18) being mutually offset, it being understood that each lateral part of the slots delimits a space free from any electrode material and current-collector substrate, said free space separating, for each anode and each cathode, a main body from a secondary body,

b) the implementation of a heat treatment and/or of a mechanical compression of the stack of alternating sheets previously provided,

c) the production of two cutouts ($D_n$, $D'_n$) extending at least partially inside said slots, the first cutout extending between the lateral part of the anode slot and the facing end of the longitudinal parts, whereas the second cutout extends between the lateral part of the cathode slot and the facing end of the longitudinal parts.

15. The method according to claim 14, characterized in that, after the step c), the cut-out stack is encapsulated, by depositing:

- at least one first covering layer, preferably selected from parylene, type-F parylene, polyimide, epoxy resins, silicone, polyamide, sol-gel silica, organic silica and/or a mixture thereof, on the battery,

- at least one second covering layer composed of an electrically insulating material, deposited by deposition of atomic layers on said at least one first covering layer, on the understanding that the sequence of at least one first covering layer and of at least one second covering layer may be repeated z times with $z \geq 1$.

16. The method according to claim 15, characterized in that, after the step d) of encapsulating the cut-out stack, the cut-out and encapsulated stack is impregnated, by a phase carrying lithium ions such as liquid electrolytes or an ionic liquid containing lithium salts.

17. The method according to claim 15 or claim 16, characterized in that the terminations of the battery are produced by successively depositing:
- a first layer of a material filled with graphite, preferably based on an epoxy resin filled with graphite,
- a second dense layer of metallic copper arranged on the first layer of the termination system, and
- optionally, a third layer based on a tin-zinc alloy of tin, arranged on the second layer of the termination system,
- optionally a fourth layer based on tin or based on an alloy of silver, palladium and copper, arranged on the third layer of the termination system.

18. The method according to any one of claims 14 to 17, characterized in that the two cutouts ($D_n$, $D'_n$) are produced through at least a majority of the anodes and cathodes, in particular through all the anodes and cathodes.

19. The method according to claim 18, characterized in that the distances between each cutout and the facing ends of the longitudinal parts are identical.

20. The method according to claim 19, characterized in that its distances are between 0.05 mm and 2 mm.

21. The method according to any one of claims 14 to 20, characterized in that each slot has a roughly H shape, the longitudinal parts forming the vertical main recesses of the H, whereas the lateral part forms the channel of the H.

22. The method according to claim 21, characterized in that the width of the lateral part is between 0.05 mm and 2 mm.

23. The method according to any one of claims 14 to 22, characterized in that each sheet belonging to said stack comprises a plurality of slot lines disposed alongside each other, and in that the two cutouts are made through all the slots on the same line.

24. The method according to any one of claims 14 to 22, characterized in that each sheet comprises a plurality of rows of slots disposed one below the other.

25. The method according to claim 24, characterized in that the distance separating adjacent cutouts, formed in adjacent lines, is between 0.05 mm and 5 mm.

26. The method according to one of claims 24 or 25, characterized in that the number of lines is between 10 and 500 while the number of rows is between 10 and 500.

27. The method according to any one of claims 14 to 26, characterized in that each cutout is made by a sawing method, by a swaging cutting method, by guillotine, or by laser.