

C l a i m s

1.
A method for formation of a Li-comprising layer on a substrate by atomic layer
5 deposition comprising the following steps:
 - a) providing a substrate in a reaction chamber wherein said reaction chamber is arranged for gas-to-surface reactions,
 - b) pulsing a lithium precursor through said reaction chamber,
 - c) reacting said lithium precursor with at least one surface of said substrate,
 - 10 d) purging of said reaction chamber
 - d1) by sending a purge gas through said reaction chamber for the purging of the reaction chamber or
 - d2) by evacuating said chamber, and
 - e) repeating steps b) to d) a desired number of times in order for the formation of a thin
15 film layer of a lithium comprising material upon said at least one surface of said substrate.

2.
A method according to claim 1 wherein steps b) through d) are repeated with
20 independently chosen lithium precursors in step b).

3.
A method according to claim 1, wherein an oxidising gas is pulsed through said reaction chamber such that the resulting deposition sequence comprises
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 - a) providing a substrate in a reaction chamber wherein said reaction chamber is arranged for gas-to-surface reactions,
 - b) pulsing a lithium precursor through said reaction chamber,
 - c) reacting said lithium precursor with at least one surface of the substrate,
 - d) purging of said reaction chamber,
 - 30 e) pulsing an oxygen precursor through said reaction chamber,
 - f) reacting said oxygen precursor with said at least one surface of said substrate,
 - g) purging of said reaction chamber,

h) repeating steps b) to g) a desired number of times in order for the formation of a thin film layer of a lithium comprising material upon said at least one surface of said substrate,

where the purging of said chamber may be performed by sending a purge gas through said reaction chamber for the purging of the reaction chamber or by evacuating said chamber.

4.

A method according claim 3 wherein further to the described steps, a lanthanum comprising precursor is pulsed through the reaction chamber such that the reaction resulting sequence comprises:

- a) providing a substrate in a reaction chamber wherein said reaction chamber is arranged for gas-to-surface reactions,
- b) pulsing a lanthanum precursor through said reaction chamber,
- 15 c) reacting said lanthanum precursor with said at least one surface of said substrate,
- d) purging of said reaction chamber,
- e) pulsing an oxygen precursor through said reaction chamber,
- f) reacting said oxygen precursor with said at least one surface of said substrate,
- 20 g) purging of said reaction chamber,
- h) pulsing a lithium precursor through said reaction chamber,
- i) reacting said lithium precursor with a surface layer of the substrate,
- j) purging of said reaction chamber,
- 25 k) pulsing an oxygen precursor through said reaction chamber,
- l) reacting said oxygen precursor with said at least one surface of said substrate,
- m) purging of said reaction chamber,
- n) repeating steps b) to m) a desired number of times in order for the formation of a thin film layer of a lithium and lanthanum comprising material upon said at least one surface of said substrate,
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where the purging of said chamber may be performed by sending a purge gas through said reaction chamber for the purging of the reaction chamber or by evacuating said chamber.

5 5.

A method according claim 4 wherein further to the described steps, a titanium comprising precursor is pulsed through the reaction chamber such that the reaction resulting sequence comprises:

- 10 a) providing a substrate in a reaction chamber wherein said reaction chamber is arranged for gas-to-surface reactions,
- b) pulsing a lanthanum precursor through said reaction chamber,
- c) reacting said lanthanum precursor with said at least one surface of said substrate,
- d) purging of said reaction chamber,
- 15 e) pulsing an oxygen precursor through said reaction chamber,
- f) reacting said oxygen precursor with said at least one surface of said substrate,
- g) purging of said reaction chamber,
- h) pulsing a lithium precursor through said reaction chamber,
- 20 i) reacting said lithium precursor with a surface layer of the substrate,
- j) purging of said reaction chamber,
- k) pulsing an oxygen precursor through said reaction chamber,
- l) reacting said oxygen precursor with said at least one surface of said substrate,
- 25 m) purging of said reaction chamber,
- n) pulsing a titanium precursor through said reaction chamber,
- o) reacting said titanium precursor with said at least one surface of said substrate,
- p) purging of said reaction chamber,
- 30 q) pulsing an oxygen precursor through said reaction chamber,
- r) reacting said oxygen precursor with said at least one surface of said substrate,

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- s) purging of said reaction chamber,
- t) repeating steps b) to s) a desired number of times in order for the formation of a thin film layer of a lithium, lanthanum and titanium comprising material upon said at least one surface of said substrate,

5 where the purging of said chamber may be performed by sending a purge gas through said reaction chamber for the purging of the reaction chamber or by evacuating said chamber.

6.

10 A method according to any one of the previous claims, wherein each step of the process is independently repeated a desired number of times.

7.

A method according claim 6, where the groups of steps b)-g), f)-m) and n)-s) respectively are independently repeated one or more times before continuing the sequence.

8.

A method according to any one of the preceding claims, where the thin film layer is an oxide or a carbonate layer or a mixture thereof.

9.

A method according claim 5, 6, 7 or 8 for the production of a La- Li -Ti-O layered thin film.

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10.

A method according to any one of the above claims wherein the lithium precursor is chosen from a metal-organic compound such as lithium 2,2,6,6-tetramethylheptane-3,5-dionate, a lithium alkoxide or a lithium alkyl.

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11.

A method according to any one of the above claims wherein the lithium precursor is a bimetallic compound such as Ti-Li compounds.

5 12.

A method according to any of the above claims for the production of a lithium-comprising thin film battery.

13.

10 A method according to any of the above claims for the production of a lithium-comprising electrolyte thin film for use in a battery.