

REMARKS

Claims 1-9 and 12-25 are currently pending in this application. Claims 10-11 were previously canceled without prejudice.

Allowed Subject Matter

The Examiner is thanked for indicating that claims 4, 5, 9 and 14-25 are allowed.

Claim Rejections - 35 USC §103

Claims 1-3, 6-8, 10 and 12-13 are newly rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Gordon et al. U.S. Pub. 2005/0277780 (Gordon) in view of Jensen et al. U.S. Pub. 2008/0026929 (Jensen). This rejection is respectfully traversed.

Claim 1 defines a method for formation of a Li-comprising layer on a substrate by atomic layer deposition by pulsing a lithium precursor through a reaction chamber where:

the lithium precursor is selected from among lithium 2,2,6,6-tetramethylheptane-3,5-dionate, lithium alkoxides, lithium alkyls, cyclic lithium compounds, lithium dicyclohexamide, and bimetallic or multimetallic compounds.

Neither Gordon nor Jensen disclose or suggest the use of such precursors in the claimed process. As indicated at page 6 of the Office Action the prior art does not disclose or suggest the use of lithium alkyls. However, the cited references do not disclose or suggest the other claimed precursors defined by claim 1.

With respect to the other claimed lithium precursor materials, the disclosure of lithium bis(ethyldimethylsilyl)amide in the Abstract of Gordon is cited. As noted in previously, Gordon's disclosure of precursor materials in paragraph 44 and Table 2 of Gordon fails to disclose any lithium compounds at all. Lithium bis(ethyldimethylsilyl)amide is not taught by Gordon as a lithium precursor as recited in claim 1, nor is it a member of any of the classes of precursor which are recited in the claim.

With respect to bimetallic and multimetallic compound precursors, Jensen is cited. However, Jensen does not remedy the deficiencies of Gordon.

Jensen paragraph [0162] is cited for teaching bimetallic precursors. However, when read in context, it is clear that Jensen does not teach such compounds. A bimetallic precursor is a compound containing two metals, not a mere admixture of two separate monometallic precursors.

At the final paragraph of page 5 of the Office Action, paragraph [0162] is highlighted as referring to "a combination of different precursors". However, read in context, it is clear that Jensen is referring to a combination of different individual

monometallic precursors. This is not a disclosure of metal compounds as claimed in the recitation of bimetallic and multimetallic compound precursors recited in claim 1.

The reference to “a combination of the different precursors” in Jensen paragraph [0162], is not a disclosure of a precursor with a combination of metals. Paragraph [0162] defines “the metal [singular] containing precursor” by reference to a list of metals. The alternative suggested in Jensen is the use of multiple metal containing precursors as so defined; there is no teaching or suggestion of bimetallic or multimetallic compounds used as a precursor. In other words, paragraph [0162] informs the reader that the metal containing precursor is either the (i.e. a single) metal donor, or a combination of different precursors may be used, wherein in each metal precursor, the metal is selected from the list which has been placed in parentheses in the second reading outlined above. Therefore it is clear in context that Jensen paragraph [0162] does not disclose or suggest metal compound precursors.

In viewing the reference as a whole, one notes that Jensen refers consistently throughout to monometallic precursors. Only monometallic precursors are exemplified, for instance at paragraph [0161], at paragraphs [0173] to [0175], and in the Examples. While it is appreciated that the teaching of Jensen is not limited to the individualized examples given, these must nonetheless be considered

illustrative of the scope and spirit of the overall teaching of the document. Nowhere does Jensen contemplate the use of a multimetallic precursor. As noted previously, to the extent that Jensen might contemplate using two metals (e.g. Li and Ti) together, this is in the form of a combination of two separate, monometallic precursors. There is nothing to indicate that paragraph [0162] has any special, distinct significance compared to the overall teaching of Jensen which should allow it to be interpreted otherwise.

Furthermore, the technical field of Jensen differs from that of Gordon and that of the invention. Jensen relates to an entirely different technical field from that of both the instant invention and that of Gordon. Accordingly, the skilled person would have no reason to expect that the precursors of Jensen (whether bimetallic or otherwise) would be applicable to the methods of Gordon or indeed the present invention.

Gordon relates to Chemical Vapor Deposition (CVD) and Atomic Layer Deposition (ALD). The present invention relates to ALD. Jensen, by contrast, describes the synthesis of sub-micron sized particles through a solution based method, including super critical solvent. As such, Jensen is concerned with the application of a solvent for formation of powder materials. Jensen thus addresses an entirely different problem, and as a result of this, exploits chemistry which is

completely different from that governing ALD growth. ALD relies on the self-limiting chemistry which occurs between a gas phase and a solid surface.

The skilled person would be well aware that the mere fact that a given compound may be known to function as a “precursor” in a solution chemistry method, does not mean that it would also be expected to function in gas phase-based, surface chemistry-governed method such as ALD.

It is a requirement in selecting precursors for ALD that the precursor needs to be volatile while also remaining thermally stable throughout the reaction process, which typically takes place at elevated temperatures. The lack of a solvent in ALD, i.e. using the gas phase, also limits the possible reaction paths severely since no benefit can be obtained from dissolved catalysts, proton exchange with the solvent, or other mechanistic paths which are available in solution chemistry. Bearing in mind these factors the skilled person would have absolutely no expectation that the “precursors” taught by Jensen would have any bearing on the selection of precursors for the ALD methods taught by Gordon or which are the subject of the present invention.

To summarize, it is clear that:

- (i) Gordon does not teach lithium precursors as defined by claim 1;
- (ii) Jensen does not teach bimetallic or multimetallic precursors as defined

by claim 1; and

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(iii) Jensen relates to an entirely different technical field to Gordon and to the present invention, and thus the skilled person would have no reason to expect that the precursors taught in Jensen would be applicable in the ALD methods which are the subject of the present invention.

Based on the arguments presented above, withdrawal of the obviousness rejection of claim 1 and the claims dependent thereon is respectfully requested.

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Conclusion

If the Examiner believes that any additional minor formal matters need to be addressed in order to place this application in condition for allowance, or that a telephone interview will help to materially advance the prosecution of this application, the Examiner is invited to contact the undersigned by telephone at the Examiner's convenience.

In view of the foregoing amendment and remarks, Applicants respectfully submit that the present application, including claims 1-9 and 12-25, is in condition for allowance and a notice to that effect is respectfully requested.

Respectfully submitted,

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