

EXHIBIT 048-B

***Inpria Corporation v. Lam Research Corp.*, Case No. 1-22-cv-01359-CJB
Exhibit 048-B - Invalidity Claim Chart for U.S. Patent No. 11,537,048**

Maeng, W. J., Sang-Joon Park, and H. Kim. "Atomic layer deposition of Ta-based thin films: Reactions of alkylamide precursor with various reactants." *Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures Processing, Measurement, and Phenomena* 24.5 (2006): 2276-2281 ("Maeng") published in **2006**. Maeng is therefore prior art to the '048 Patent under AIA 35 U.S.C. 102(a)(1).

Cardineau, Brian, et al. "Photolithographic properties of tin-oxo clusters using extreme ultraviolet light (13.5 nm)." *Microelectronic engineering* 127 (2014): 44-50 ("Cardineau Paper") published on **April 24, 2014**. The Cardineau Paper is therefore prior art to the '048 Patent under AIA 35 U.S.C. 102(a)(1).

Banse, Frederic, et al. "Hydrolysis of monobutyltin trialkoxides: Synthesis and characterizations of $\{(BuSn)_2O_4(OH)_6\}(OH)_2$." *Inorganic Chemistry* 34.25 (1995): 6371-6379 ("Banse") published on **December 1, 1995**. Banse is therefore prior art to the '048 Patent under AIA 35 U.S.C. 102(a)(1).

Jaumier, Pascale, et al. "New route to monoorganotin oxides and alkoxides from trialkynylorganotins." *Chemical Communications* 3 (1998): 369-370 ("Jaumier") published in **1998**. Jaumier is therefore prior art to the '048 Patent under AIA 35 U.S.C. 102(a)(1).

Molloy, Kieran C. "Precursors for the formation of tin (IV) oxide and related materials." *Journal of Chemical Research* 2008.10 (2008): 549-554 ("Molloy") published on **October 21, 2008**. Molloy is therefore prior art to the '048 Patent under AIA 35 U.S.C. 102(a)(1).

Blanksby, Stephen J., and Ellison, G. Barney. "Bond dissociation energies of organic molecules." *Accounts of chemical research* 36.4 (2003): 255-263 ("Blanksby") published in **2003**. Blanksby is therefore prior art to the '048 Patent under AIA 35 U.S.C. 102(a)(1).

Blunden, S. J., R. Hill, and S. E. Sutton. "A thermal analytical study of some mono-and di-organotin oxides and carboxylates." *Applied organometallic chemistry* 5.3 (1991): 159-165 ("Blunden") published in **1991**. Blunden is therefore prior art to the '048 Patent under AIA 35 U.S.C. 102(a)(1).

De Stefano, Concetta, et al. "Hydrolysis processes of organotin (IV) compounds in sea water." *Chemical processes in marine environments*. Berlin, Heidelberg: Springer Berlin Heidelberg, 2000. 213-228 ("De Stefano") published in **January 2000**. De Stefano is therefore prior art to the '048 Patent under AIA 35 U.S.C. 102(a)(1).

Valla, Vasiliki, and Maria Bakola-Christianopoulou. "Chemical Aspects of Organotin Derivatives of Beta-diketones, Quinonoids, Steroids and Some Currently Used Drugs: A Review of the Literature with Emphasis on the Medicinal Potential of Organotins." *Synthesis and Reactivity in Inorganic, Metal-Organic and Nano-Metal Chemistry* 37.7 (2007): 507-525 ("Valla") published on **September 1, 2007**. Valla is therefore prior art to the '048 Patent under AIA 35 U.S.C. 102(a)(1).

U.S. Patent Publication No. 2011/0183527 ("Cho '527") **published on July 28, 2011**. Cho is therefore prior art to the '048 Patent under AIA 35 U.S.C. 102(a)(1).

U.S. Patent Publication No. 2012/0207927 ("Dussarrat '927") **published August 16, 2012**. Dussarrat is therefore prior art to the '048 Patent under AIA 35 U.S.C. 102(a)(1).

U.S. Patent Publication No. 2012/0088369 ("Weidman '369") **published April 12, 2012**. Weidman '369 is therefore prior art to the '048 Patent under AIA 35 U.S.C. 102(a)(1).

U.S. Patent Publication No. 2012/0088193 ("Weidman '193") published **April 12, 2012**. Weidman '193 is therefore prior art to the '048 Patent under AIA 35 U.S.C. 102(a)(1).

Van Mol, A. M. B., et al. "Chemical vapor deposition of tin oxide: Fundamentals and applications." *Thin Solid Films* 502.1-2 (2006): 72-78 ("Van Mol 2006") published in **2006**. Van Mol 2006 is therefore prior art to the '048 Patent under AIA 35 U.S.C. 102(a)(1).

Van Mol, A. M. B., et al. "Chemical vapour deposition of tin oxide thin films." (2003). [Phd Thesis 1 (Research TU/e / Graduation TU/e), Chemical Engineering and Chemistry]. Technische Universiteit Eindhoven. <https://doi.org/10.6100/IR569472> ("Van Mol 2003") published in **2003**. Van Mol 2003 is therefore prior art to the '048 patent under AIA 35 U.S.C. 102(a)(1).

Maeng renders Asserted Claims 1-10, 14-20 of the '048 Patent obvious alone, in combination with the Cardineau Paper, Van Mol 2006, Van Mol 2003, Banse, Jaumier, Molloy, Blunden, Blanksby De Stefano, Valla, Cho '527, Dussarrat '927, Weidman '369, and Weidman '193 in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified in Defendant's Invalidity Contentions, including as set forth in this chart.

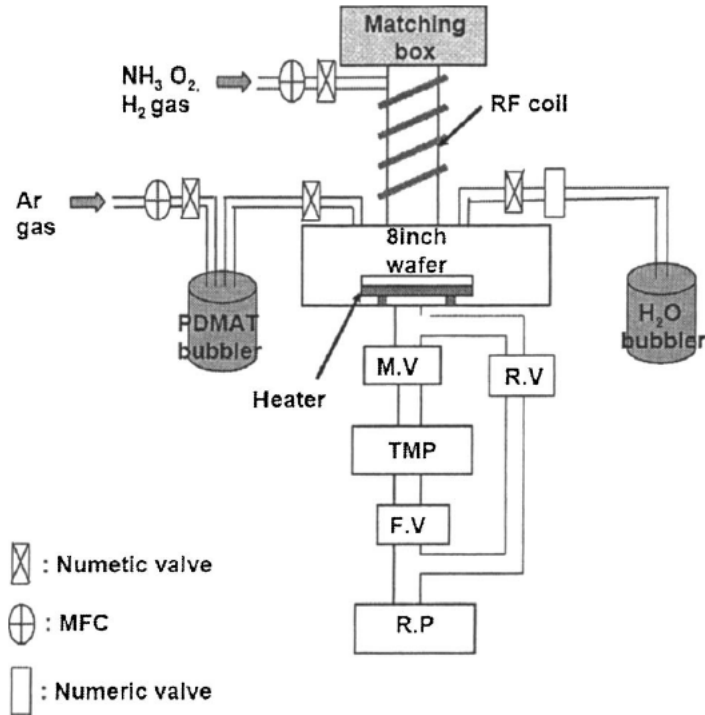
With respect to the obviousness of the asserted claims under 35 U.S.C. § 103, one or more of the principles enumerated by the United States Supreme Court in *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398 (2007) apply, including: (a) combining various claimed elements known in the prior art according to known methods to yield a predictable result; (b) making a simple substitution of one or more known elements for another to obtain a predictable result; (c) using a known technique to improve a similar device or method in the same way; (d) applying a known technique to a known device or method ready for improvement to yield a predictable result; (e) choosing from a

finite number of identified, predictable solutions with a reasonable expectation of success or, in other words, the solution was one which was “obvious to try”; (f) a known work in one field of endeavor prompting variations of it for use either in the same field or a different field based on given design incentives or other market forces in which the variations were predictable to one of ordinary skill in the art; and/or (g) a teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill in the art to modify the prior art reference or to combine the teachings of various prior art references to arrive at the claimed invention. It would have been obvious to a person of ordinary skill in the art to combine the Lam ’416 with the general knowledge of a person of ordinary skill in the art, and/or one or more of the references identified in Defendant’s Invalidity Contentions in accordance with the principles and rationales set forth above.

Beyond the specific motivations identified in the cited references, motivation to modify and combine particular references comes from: (a) the nature of the problem being solved; (b) the teachings of the prior art; (c) the knowledge of persons of ordinary skill in the art; (d) the fact that the references address the same or similar technical issues as the ’048 patent; and (e) considerations of efficiency, effectiveness, convenience, cost-savings, and accessibility to combine the various teachings.

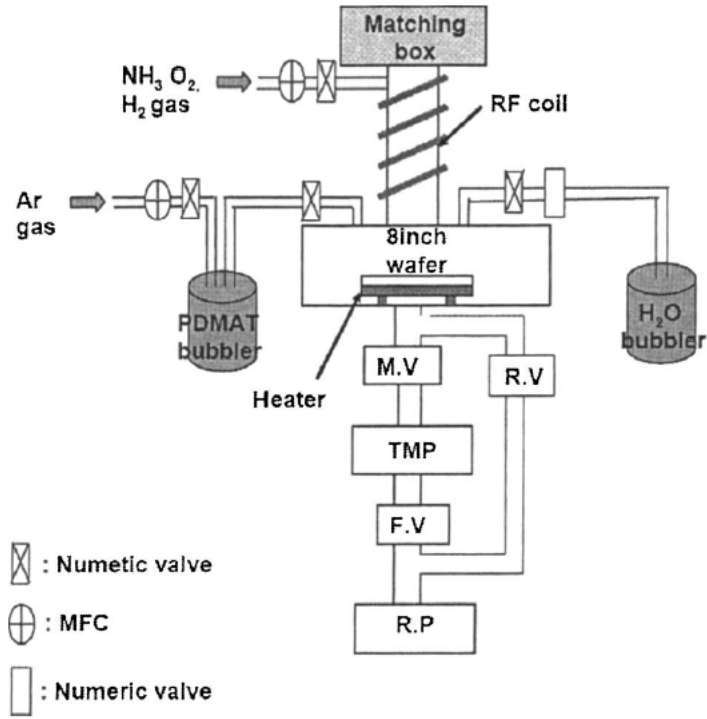
This claim chart is meant to illustrate one example of how the asserted claims are invalid for obviousness. By not discussing portions of a reference in the claim chart below, Defendant does not waive its right to rely on these portions of the reference. Instead, Defendant expressly reserves the right to rely on any and all portions of the cited references. These contentions are not an admission by Defendant that any accused materials are covered by or infringe the asserted claims of the ’048 patent, particularly after the claims are construed by the Court. These contentions are not an admission by Defendant as to the proper scope of any asserted claim, the proper construction of any term in any asserted claim, or whether particular elements may be construed at all, or instead, are indefinite. Defendant reserves the right to modify, amend, or supplement these contentions as additional information becomes available during the course of this action and in view of any applicable claim construction order from the Court.

'048 Patent Claims	Disclosure of Prior Art
Claim 1	
[1p] A system comprising: a deposition chamber having an interior isolated from the ambient atmosphere	If the court finds that Maeng provides the structure for the MPF elements as Plaintiff has argued, then it is rendered obvious by Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, which discloses and/or suggests this claim limitation. Maeng discloses an apparatus comprising a deposition chamber having an interior isolated from the ambient atmosphere. Maeng at Figure 1:

'048 Patent Claims	Disclosure of Prior Art
	 FIG. 1. Schematic diagram for the PE-ALD system. <i>Id.</i> at 2276-77: “The schematic of PE-ALD system utilized in this study is shown Fig. 1. Sample size as large as 8 in. can be loaded and the chamber is pumped by turbo molecular pump with a base pressure of 10^{-7} Torr.” <i>Id.</i> at 2277: “With these flow, the chamber pressure during reactant exposure increased to about 10 mTorr at standard growth condition.” A person of ordinary skill in the art would understand that the chamber has an interior isolated from the ambient atmosphere given that the “chamber is pumped by turbo molecular pump with a base pressure of

'048 Patent Claims	Disclosure of Prior Art
	10⁻⁷ Torr.” Maeng discloses adjusting a pressure of the chamber necessarily means that the chamber has an interior isolated from the ambient atmosphere. Moreover, as Inpria stated during the prosecution of the '048 Patent: '048 Patent PH, 9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.” <i>Id.</i>, 5-4-2021 Response at 8: “The Drawings are amended to add elements 176, 178, and 180 to Fig. 16. The specification supports the amendment of the Drawings, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. which illustrates the apparatus for the introduction of a vapor phase (gas) reactant, as further described, for example, at page 2279 in the last paragraph of the left hand column and in the first paragraph of the Discussion on page 2280. The specification is amended to refer to the elements added to Fig. 16.” <i>Id.</i>, 1-20-2021 Response at 8: “Specifically, claim 1 is amended to specify that the apparatus comprises an inlet into the deposition chamber and structure configured to deliver flow from a supply of an inert gas. The specification supports the amendment of claim 1, for example, at page 25, line 18 via the disclosure of a separate inlet which implies an inlet. The specification further supports the amendment of claim 1, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. Claim 1 is further amended to specify ‘with the inert gas as a carrier gas to the inlet’. ... The Drawings are amended to include a Fig. 16. The specification supports Fig. 16, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. The specification is amended to refer to Fig. 16.”

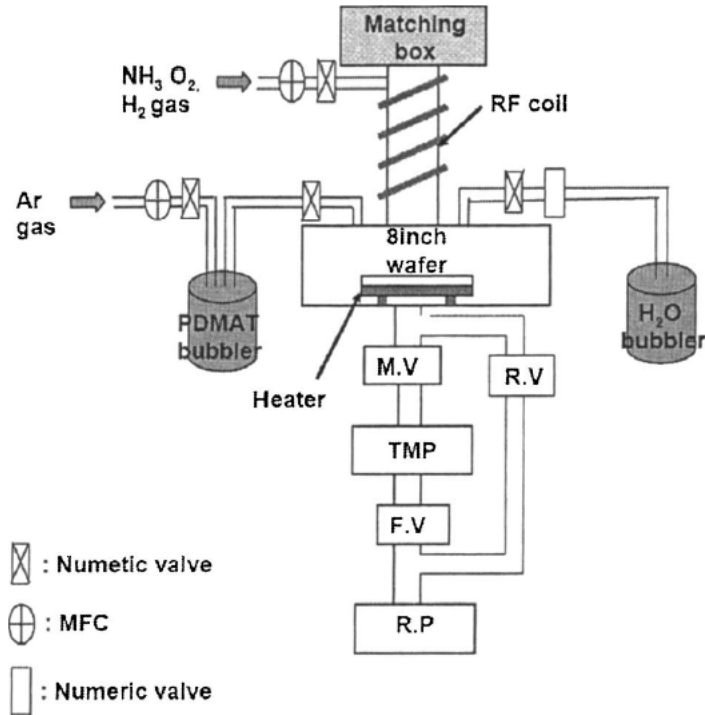
'048 Patent Claims	Disclosure of Prior Art
	<i>Id.</i> at 8-9: “The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The drawings have been amended. In particular, Fig. 16 has been added to the Drawings as discussed above.”
[1a] a substrate within the interior of the deposition chamber configured to receive a deposition on a surface of the substrate,	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses a substrate within the interior of the deposition chamber configured to receive a deposition on a surface of the substrate. Maeng at Figure 1:

'048 Patent Claims	Disclosure of Prior Art
	 FIG. 1. Schematic diagram for the PE-ALD system. Moreover, as Inpria stated during the prosecution of the '048 Patent: 9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.”

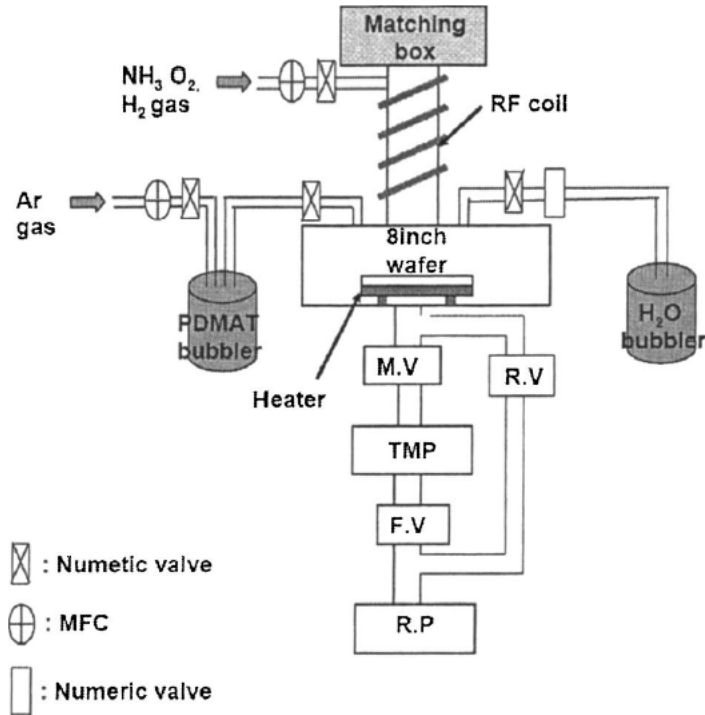
'048 Patent Claims	Disclosure of Prior Art
	<i>Id.</i>, 5-4-2021 Response at 8: “The Drawings are amended to add elements 176, 178, and 180 to Fig. 16. The specification supports the amendment of the Drawings, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. which illustrates the apparatus for the introduction of a vapor phase (gas) reactant, as further described, for example, at page 2279 in the last paragraph of the left hand column and in the first paragraph of the Discussion on page 2280. The specification is amended to refer to the elements added to Fig. 16.” <i>Id.</i>, 1-20-2021 Response at 8: “Specifically, claim 1 is amended to specify that the apparatus comprises an inlet into the deposition chamber and structure configured to deliver flow from a supply of an inert gas. The specification supports the amendment of claim 1, for example, at page 25, line 18 via the disclosure of a separate inlet which implies an inlet. The specification further supports the amendment of claim 1, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. Claim 1 is further amended to specify ‘with the inert gas as a carrier gas to the inlet’. ... The Drawings are amended to include a Fig. 16. The specification supports Fig. 16, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. The specification is amended to refer to Fig. 16.” <i>Id.</i> at 8-9: “The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The drawings have been amended. In particular, Fig. 16 has been added to the Drawings as discussed above.”
[1b] wherein the substrate is maintained at a temperature of less than 200° C.;	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses reaction temperatures ranging from 150 to 250 °C, which overlaps with the claimed range.

'048 Patent Claims	Disclosure of Prior Art
	Maeng at 2277: “PE-ALD has shown broader temperature range than thermal ALD (data not shown) due to the presence of radicals (mostly oxygen atoms in this case) leading to higher reactivity. This region is 200–250 °C for thermal ALD and 150–250 °C for PE-ALD.” Moreover, as Inpria stated during the prosecution of the '048 Patent: 9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.” <i>Id.</i>, 5-4-2021 Response at 8: “The Drawings are amended to add elements 176, 178, and 180 to Fig. 16. The specification supports the amendment of the Drawings, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. which illustrates the apparatus for the introduction of a vapor phase (gas) reactant, as further described, for example, at page 2279 in the last paragraph of the left hand column and in the first paragraph of the Discussion on page 2280. The specification is amended to refer to the elements added to Fig. 16.” <i>Id.</i>, 1-20-2021 Response at 8: “Specifically, claim 1 is amended to specify that the apparatus comprises an inlet into the deposition chamber and structure configured to deliver flow from a supply of an inert gas. The specification supports the amendment of claim 1, for example, at page 25, line 18 via the disclosure of a separate inlet which implies an inlet. The specification further supports the amendment of claim 1, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. Claim 1 is further amended to specify ‘with the inert gas as a carrier gas to the inlet’. ... The Drawings are amended to include a Fig. 16. The specification supports Fig. 16, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. The specification is amended to refer to Fig. 16.”

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	<i>Id.</i> at 8-9: “The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The drawings have been amended. In particular, Fig. 16 has been added to the Drawings as discussed above.”
[1c] an inlet into the deposition chamber;	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses an inlet into the deposition chamber. Maeng at Figure 1:

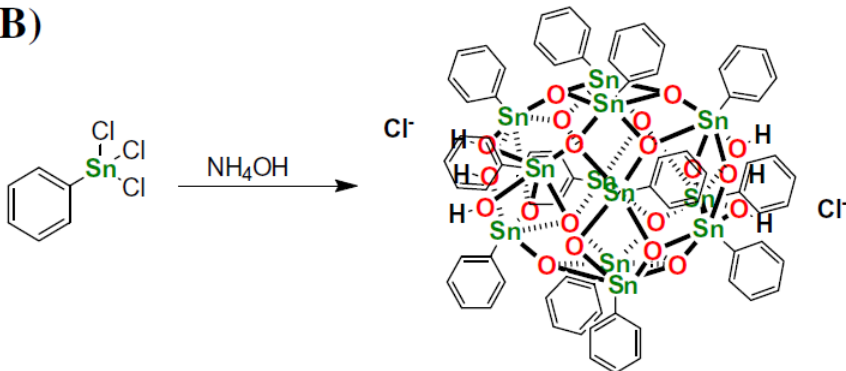
'048 Patent Claims	Disclosure of Prior Art
	 FIG. 1. Schematic diagram for the PE-ALD system. Moreover, as Inpria stated during the prosecution of the '048 Patent: 9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.”

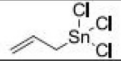
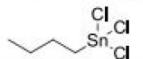
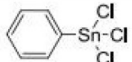
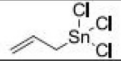
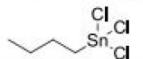
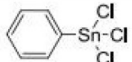
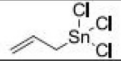
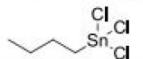
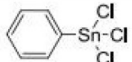
'048 Patent Claims	Disclosure of Prior Art
	<i>Id.</i>, 5-4-2021 Response at 8: “The Drawings are amended to add elements 176, 178, and 180 to Fig. 16. The specification supports the amendment of the Drawings, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. which illustrates the apparatus for the introduction of a vapor phase (gas) reactant, as further described, for example, at page 2279 in the last paragraph of the left hand column and in the first paragraph of the Discussion on page 2280. The specification is amended to refer to the elements added to Fig. 16.” <i>Id.</i>, 1-20-2021 Response at 8: “Specifically, claim 1 is amended to specify that the apparatus comprises an inlet into the deposition chamber and structure configured to deliver flow from a supply of an inert gas. The specification supports the amendment of claim 1, for example, at page 25, line 18 via the disclosure of a separate inlet which implies an inlet. The specification further supports the amendment of claim 1, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. Claim 1 is further amended to specify ‘with the inert gas as a carrier gas to the inlet’. ... The Drawings are amended to include a Fig. 16. The specification supports Fig. 16, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. The specification is amended to refer to Fig. 16.” <i>Id.</i> at 8-9: “The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The drawings have been amended. In particular, Fig. 16 has been added to the Drawings as discussed above.”
[1d] structure configured to deliver flow from a supply of an inert gas;	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses a structure configured to deliver flow from a supply of an inert gas. Maeng at Figure 1:

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	 FIG. 1. Schematic diagram for the PE-ALD system. Moreover, as Inpria stated during the prosecution of the '048 Patent: 9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.”

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[1e] a supply of an organotin composition comprising a compound described by the formula $R\text{SnX}_3$, where R is an organic ligand with 1-31 carbon atoms and is bound to Sn with a metal-carbon bond and	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses a structure configured to deliver a supply of an organometallic precursor (i.e. pentadimethylamido Tantalum (PDMAT)). Maeng at Figure 1:

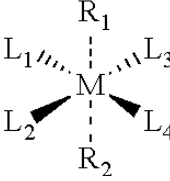
'048 Patent Claims	Disclosure of Prior Art
	FIG. 1. Schematic diagram for the PE-ALD system. The Cardineau Paper discloses a method of forming a radiation patternable film comprising tin-oxo clusters having the formula $[(\text{RSn})_{12}\text{O}_{14}(\text{OH})_6]\text{X}_2$. Cardineau Paper at 44: “Here we describe the synthesis and lithographic evaluation of thin films of tin-oxo clusters $[(\text{RSn})_{12}\text{O}_{14}(\text{OH})_6]\text{X}_2$, Fig. 1A) using extreme ultraviolet light (EUV, 13.5 nm). These types of tin clusters have been known for over 20 years.”

'048 Patent Claims	Disclosure of Prior Art
	<i>Id.</i> at 45: “The lithographic performance of eight tin-oxo clusters were then evaluated lithographically using the EUV interference lithography tool at Paul Scherrer Institute (PSI) and the results were analysed.” Cardineau at 2. <i>Id.</i> at 48: “Fig. 6. Synthesis of tin clusters from alkyltin trichlorides. ... (B) Hydrolysis of phenyltin trichloride using ammonium hydroxide produces a soluble polymeric material which shows evidence that it is the tin cluster.” Cardineau at 5. The Cardineau Paper discloses forming tin-oxo clusters from the hydrolysis of organotin trichloride precursors. Cardineau Paper at 48: “Fig. 6. Synthesis of tin clusters from alkyltin trichlorides. ... (B) Hydrolysis of phenyltin trichloride using ammonium hydroxide produces a soluble polymeric material which shows evidence that it is the tin cluster.” Cardineau at 5. (B)  <i>Id.</i> at 49: “General synthetic procedure for compounds 8 through 10: Water (20 mL) was placed in a 50 mL round-bottom flask equipped with a stirbar and reflux condenser and nitrogen was bubbled through for ten minutes. The flask was placed under nitrogen, and ammonium hydroxide (25% solution, 6.309 g, 45 mmol) was added to the flask as the flask was cooled using an ice bath. Organotin trichloride was quickly added to the flask while stirring, and the solution was refluxed for 30 min. Upon completion, the flask was cooled to room temperature and filtered through Celite. The Celite was washed twice with tetrahydrofuran, and the combined organic and

'048 Patent Claims	Disclosure of Prior Art												
	aqueous solutions were extracted three times with ethyl acetate. The organic phases were combined, dried over sodium sulfate and condensed under reduced pressure. The crude oil was then dissolved in diethyl ether and precipitated with hexane to yield a solid. The solid was then dried under vacuum. $[(H_2C=CHCH_2Sn)_{12}O_{14}(OH)_6]Cl_2$ (8): Allyltin trichloride (3.992 g, 15 mmol) was used as the organotin trichloride. ^1H NMR (400 MHz $CDCl_3$) δ 6.13 (1 H), 5.34 (1 H), 5.30 (1 H), 2.50 (2 H). $[(BuSn)_{12}O_{14}(OH)_6]Cl_2$ (9): Butyltin trichloride (4.233, 15 mmol) was used as the organotin trichloride. ^1H NMR (400 MHz $CDCl_3$) δ 1.84 (2 H), 1.79 (2 H), 1.72 (2 H), 1.63 (2 H), 1.52 (2 H), 1.81 (2 H), 0.97 (3 H), 0.88 (3 H). $[(PhSn)_{12}O_{14}(OH)_6]Cl_2$ (10): Phenyltin trichloride (4.533 g, 15 mmol) was used as the organotin trichloride. ^1H NMR (400 MHz $CDCl_3$) δ 7.10 (5 H).” <i>See also Cardineau Dissertation at 158:</i> <table><tr><th>Tin Trichloride Precursor:</th><th>Structure:</th><th>C-H Bond Dissociation Energy (kcal/mol):</th></tr><tr><td></td><td>(55) $[(H_2C=CHCH_2Sn)_{12}O_{14}(OH)_6]Cl_2$</td><td>88</td></tr><tr><td></td><td>(56) $[(BuSn)_{12}O_{14}(OH)_6]Cl_2$</td><td>101</td></tr><tr><td></td><td>(57) $[(PhSn)_{12}O_{14}(OH)_6] Cl_2$</td><td>113</td></tr></table> Table 5.2. Three tin-oxide materials (allyl, butyl, phenyl) were made from the hydrolysis of the corresponding organotin trichloride Allyltin trichloride, butyltin trichloride and phenyltin trichloride are compound “represented by the formula $RSnX_3$ wherein R is an organic ligand with 1-31 carbon atoms bound to Sn with a metal-carbon bond” and X is Chloro (Cl).	Tin Trichloride Precursor:	Structure:	C-H Bond Dissociation Energy (kcal/mol):		(55) $[(H_2C=CHCH_2Sn)_{12}O_{14}(OH)_6]Cl_2$	88		(56) $[(BuSn)_{12}O_{14}(OH)_6]Cl_2$	101		(57) $[(PhSn)_{12}O_{14}(OH)_6] Cl_2$	113
Tin Trichloride Precursor:	Structure:	C-H Bond Dissociation Energy (kcal/mol):											
	(55) $[(H_2C=CHCH_2Sn)_{12}O_{14}(OH)_6]Cl_2$	88											
	(56) $[(BuSn)_{12}O_{14}(OH)_6]Cl_2$	101											
	(57) $[(PhSn)_{12}O_{14}(OH)_6] Cl_2$	113											

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	At the time of the alleged invention, a person of ordinary skill in the art would have been motivated to use vapor deposition as the deposition method. A POSA would have recognized that spin-coating techniques (which is the deposition technique used in the Cardineau Paper) have many drawbacks and that vapor deposition techniques can help mitigate those drawbacks. Weidman '369 ¶ 0020: “The coating of uniform films of any material, particularly inorganic resist films over an organic underlayer with 1 Angstrom uniformity without defects is difficult to achieve by conventional spin-coating, which are often referred to as ‘wet’ techniques, or any other commonly established method for coating EUV photoresists. According to embodiments of the invention, ‘dry’ deposition techniques such as Atomic Layer Deposition (ALD) provide the unique ability to assemble a film with not only atomic layer control of thickness but also the placement of reactive functionality that can survive the (mild) deposition conditions and create developer solubility (e.g., reactivity with aqueous developers) together with high sensitivity to EUV (and other radiation such as far UV, DUV and electron beam) involving cross-linking with the loss of solubility, thus allowing patterns to be developed.” Weidman '193 ¶ 0023: “According to various embodiments of the invention, ‘dry’ deposition techniques such as chemical vapor deposition (CVD) provide the unique ability to assemble a film with not only good control of thickness, but also utilize mild deposition conditions and create developer solubility (e.g., reactivity with aqueous developers) together with high sensitivity to EUV (and other radiation carried out in a vacuum such as electron beam) involving cross-linking with the loss of solubility, thus allowing patterns to be developed.” Jones '831 at 1:19-2:1: “Thin films of tin oxide have been grown by a variety of techniques including reactive sputtering, spray pyrolysis and chemical vapour deposition (CVD). Of these techniques CVD has considerable potential due to its capability for large area growth, control of doping and film thickness and superior conformal step coverage.” Moreover, Jones '831 teaches that at the time of filing of the '048 Patent, organotin precursors such as dibutyl tin diacetate and dimethyltin dichloride were known for use in vapor deposition methods to prepare tin oxide films, and that tin oxide is a known semi-conductor.:

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	Jones '831 at 1:5-15: "The metal oxide semi-conductor tin oxide (SnO₂) has a range of important applications, such as in transparent and conducting coatings on glass and in gas- sensing devices, especially for carbon monoxide, used in environmental and automotive applications. Tin oxide gas sensors have been prepared from bulk sintered powder or from deposited thick or thin films. Thin films of tin oxide are especially suitable for gas-sensor applications, due to their better speed of response compared to thick films. Also, they can be fabricated with small dimensions on a large scale using low-cost production techniques. Also, thin films are widely compatible with existing micro-electronics technology and integrated circuits." Jones '831 at 2:2-6: "A variety of precursors have been used for the deposition of tin oxide by CVD, including stannic chloride (SnCl₄) and organotin compounds, such as dibutyltin diacetate (Bu₂Sn(OAc)₂) - dimethyltin dichloride (Me₃SnCl₂) and tetramethyltin (Me₄Sn)." Thus, a person of ordinary skill in the art would have been motivated to use Maeng's structure to deposit an organotin composition comprising a compound described by the formula RSnX₃, where R is an organic ligand with 1-31 carbon atoms and is bound to Sn with a metal-carbon bond" an organotin trichloride precursor such as the precursors disclosed in the Cardineau Paper. In the alternative, the combination of Cho '527 and Cardineau Paper provide motivation to provide "a supply of an organotin composition comprising a compound described by the formula RSnX₃, where R is an organic ligand with 1-31 carbon atoms and is bound to Sn with a metal-carbon bond." Cho '527 discloses methods of depositing metal compound layers comprising inputting into a deposition chamber a first precursor vapor comprising a metal and a ligand coordinating to the metal. Cho '527 ¶ 0048: "FIG. 1 is a flow chart illustrating a method of forming a layer in accordance with example embodiments. Referring to FIG. 1, a substrate on which a layer will be formed is loaded in a chamber (S10). The substrate may include a semiconductor substrate such as silicon substrate, a germanium substrate, a silicon-germanium substrate, a silicon-on-insulator (SOI) substrate, a germanium-on-insulator (GOI) substrate, etc. Alternatively, the substrate may include a single crystalline metal oxide substrate. For example, the substrate may include a single crystalline aluminum oxide

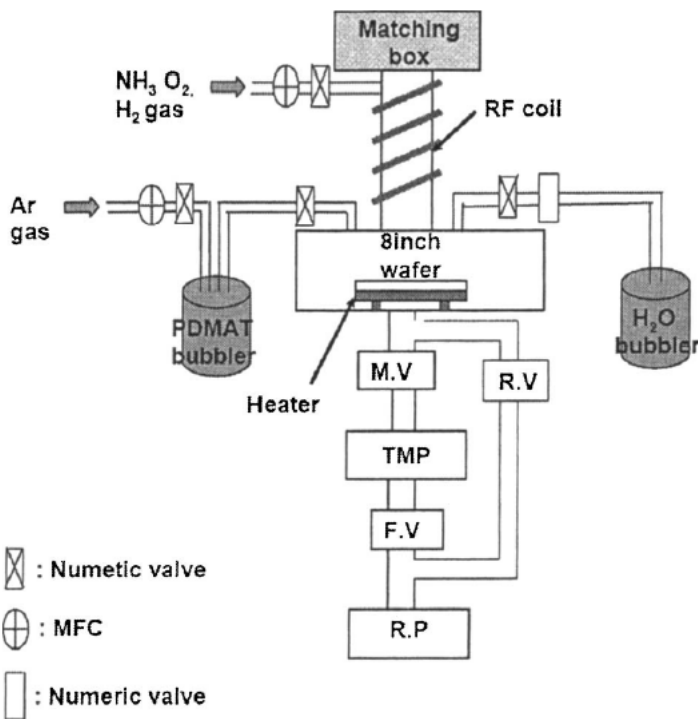
'048 Patent Claims	Disclosure of Prior Art
	(Al₂O₃) substrate, a single crystalline strontium titanium oxide (SrTiO₃) substrate or a single crystalline magnesium oxide (MgO) substrate.” <i>Id.</i> ¶ 0050: “...In example embodiments, the precursor includes a metal and a ligand coordinating to the metal.” <i>Id.</i> ¶ 0051: “The precursor may maintain a vapor state in the chamber before the precursor is chemisorbed on a surface of the substrate.” Cho '527 discloses the precursor may have the following formula (I): (1)  Cho '527 ¶ 0059: In the formula (1), M may represent a central metal such as zirconium or hafnium. L₁ to L₄ may be a ligand coordinating to the central metal and independently represent fluoro (F⁻), chloro (Cl⁻), bromo (Br⁻), iodo (I⁻), an alkoxy group having a carbon atom of about 1 to about 10, an aryl group having a carbon atom of about 6 to about 12, an allyl group having a carbon atom of about 3 to about 15, a dienyl group having a carbon atom of about 4 to about 15, a β-diketonate group having a carbon atom of about 5 to about 20, a β-ketoiminato group having a carbon atom of about 5 to about 20, a β-diiminato group having a carbon atom of about 5 to about 20, a hydroxyl group (OH), ammine (NH₃), an amine group having a carbon atom of about 1 to 10, an amido group (NH₂) or an amido group in which an alkyl group having a carbon atom of about 1 to about 10 is substituted for a hydrogen atom. ...For example, L₁ to L₄ may be dimethyl amido, diethyl amido, ethyl methyl amido, ethyl dimethyl amine, diethyl methyl amine or triethyl amine ...” <i>Id.</i> ¶ 0060: “As illustrated in formula (1), zirconium or hafnium may have a coordination number of four. Therefore, zirconium or hafnium may coordinate to four ligands to form a precursor. When the precursor

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	is contacted with the electron donating compound, the electron donating compound may donate an electron to zirconium or hafnium to stabilize the precursor. Hence, when the precursor is contacted with the electron donating compound, the stabilized precursor may have an octahedral structure similar to that of a complex compound including a central metal and six ligands coordinating to the central metal. However, the intermolecular interaction between zirconium or hafnium and the electron donating compound may be substantially weaker than a bonding force between zirconium or hafnium and the ligand.” Cho '527 discloses that the metal in the precursor may be tin. <i>Id.</i> ¶ 0052: “The metal in the precursor may include lithium (Li), beryllium (Be), boron (B), sodium (Na), magnesium (Mg), aluminum (Al), potassium (K), calcium (Ca), scandium (Sc), titanium (Ti), vanadium (V), chromium (Cr), manganese (Mn), iron (Fe), cobalt (Co), nickel (Ni), copper (Cu), zinc (Zn), gallium (Ga), germanium (Ge), rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr), niobium (Nb), molybdenum (Mo), technetium (Tc), ruthenium (Ru), rhodium (Rh), palladium (Pd), silver (Ag), cadmium (Cd), indium (In), tin (Sn), antimony (Sb), tellurium (Te), cesium (Cs), barium (Ba), lanthanum (La), lanthanide (Ln), hafnium (Hf), tantalum (Ta), tungsten (W), rhenium (Re), osmium (Os), iridium (Ir), platinum (Pt), gold (Ag), thallium (Tl), mercury (Hg), lead (Pb), bismuth (Bi), polonium (Po), francium (Fr), radium (Ra), actinium (Ac) or actinide (An). For example, the metal may include zirconium or hafnium.” Cho '527 discloses that the ligand coordinating to the metal may be varied according to the metal to adjust a boiling point of the precursor. Cho '527 discloses that the ligand coordinating to the metal may be an alkyl group having a carbon atom of about 1 to about 10, an aryl group having a carbon atom of about 6 to about 12, or an allyl group having a carbon atom of about 3 to about 15, or chloro(Cl⁻). <i>Id.</i> ¶ 0053: “The ligand coordinating to the metal may be varied according to the metal to adjust a boiling point of the precursor. In example embodiments, the ligand may include a halogen such as fluoro (F⁻), chloro(Cl⁻), bromo (Br⁻) or iodo (I⁻), a hydroxyl group (OH), ammine (NH₃), an amine group having a carbon atom of about 1 to about 10, amido(NH₂) or an amido group in which an alkyl group having a carbon atom of about 1 to about 10 is substituted for a hydrogen atom, an alkoxy group having a carbon atom of about 1 to about 10, an alkyl group having a carbon atom of about 1 to about 10, an aryl group

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	having a carbon atom of about 6 to about 12, an allyl group having a carbon atom of about 3 to about 15, a dienyl group having a carbon atom of about 4 to about 15, a β-diketonate group having a carbon atom of about 5 to about 20, a β-ketoiminato group having a carbon atom of about 5 to about 20 or a β-diiminato group having a carbon atom of about 5 to about 20. These may be used alone or in a mixture thereof. For example, the ligand may be dimethylamido ($\text{N}(\text{CH}_3)_2$), ethyl methyl amido($\text{NCH}_3\text{C}_2\text{H}_5$), diethylamido($\text{N}(\text{C}_2\text{H}_5)_2$), ethyl dimethyl amine($\text{N}(\text{CH}_3)_2\text{C}_2\text{H}_5$), diethyl methyl amine($\text{N}(\text{C}_2\text{H}_5)_2\text{CH}_3$) or triethylamine($\text{N}(\text{C}_2\text{H}_5)_3$)." Cho '527 discloses a number of example precursors: Cho '527 ¶ 0055: "In example embodiments, the precursor having the metal and the ligand may include tetrakis(ethylmethylamido)zirconium($\text{Zr}(\text{NCH}_3\text{C}_2\text{H}_5)_4$), tetrakis(ethylmethylamido)hafnium($\text{Hf}(\text{NCH}_3\text{C}_2\text{H}_5)_4$), tetrakis(diethylamido)zirconium($\text{Zr}(\text{N}(\text{C}_2\text{H}_5)_2)_4$), tetrakis(diethylamido)hafnium($\text{Hf}(\text{N}(\text{C}_2\text{H}_5)_2)_4$), tetrakis(dimethylamido)zirconium($\text{Zr}(\text{N}(\text{CH}_3)_2)_4$), tetrakis(dimethylamido)hafnium($\text{Hf}(\text{N}(\text{CH}_3)_2)_4$), tetrakis(ethyl dimethylamine)zirconium($\text{Zr}(\text{N}(\text{CH}_3)_2\text{C}_2\text{H}_5)_4$), tetrakis(ethyl dimethylamine)hafnium($\text{Hf}(\text{N}(\text{CH}_3)_2\text{C}_2\text{H}_5)_4$), tetrakis(diethylmethylamine)zirconium($\text{Zr}(\text{N}(\text{C}_2\text{H}_5)_2\text{CH}_3)_4$), tetrakis(diethylmethylamine)hafnium($\text{Hf}(\text{N}(\text{C}_2\text{H}_5)_2\text{CH}_3)_4$), tetrakis(triethylamine)zirconium($\text{Zr}(\text{N}(\text{C}_2\text{H}_5)_3)_4$), tetrakis(triethylamine)hafnium($\text{Hf}(\text{N}(\text{C}_2\text{H}_5)_3)_4$), cyclopentadienyl-tris(dimethylamido)zirconium($(\text{C}_5\text{H}_5)\text{Zr}(\text{N}(\text{CH}_3)_2)_3$), cyclopentadienyl-tris(dimethylamido)hafnium($(\text{C}_5\text{H}_5)\text{Hf}(\text{N}(\text{CH}_3)_2)_3$), cyclopentadienyl-tris(ethylmethylamido)zirconium($(\text{C}_5\text{H}_5)\text{Zr}(\text{N}(\text{C}_2\text{H}_5)(\text{CH}_3))_3$) or cyclopentadienyl-tris(ethylmethylamido)hafnium($(\text{C}_5\text{H}_5)\text{Hf}(\text{N}(\text{C}_2\text{H}_5)(\text{CH}_3))_3$). These may be used alone or in a mixture thereof." Cyclopentadienyl-tris(dimethylamido)zirconium($(\text{C}_5\text{H}_5)\text{Zr}(\text{N}(\text{CH}_3)_2)_3$), cyclopentadienyl-tris(dimethylamido)hafnium($(\text{C}_5\text{H}_5)\text{Hf}(\text{N}(\text{CH}_3)_2)_3$), cyclopentadienyl-tris(ethylmethylamido)zirconium($(\text{C}_5\text{H}_5)\text{Zr}(\text{N}(\text{C}_2\text{H}_5)(\text{CH}_3))_3$) or cyclopentadienyl-tris(ethylmethylamido)hafnium($(\text{C}_5\text{H}_5)\text{Hf}(\text{N}(\text{C}_2\text{H}_5)(\text{CH}_3))_3$) are precursors of the formula $\text{R}_n\text{ZrX}_{4-n}$ or $\text{R}_n\text{HfX}_{4-n}$ wherein R is an organic ligand with 1-31 carbon atoms bound to Zr or Hf with a metal-carbon

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	bond, $n=1-3$ and X is a ligand having a hydrolysable bond with Zr or Hf. For example, the molecular structure for cyclopentadienyl-tris(dimethylamido)hafnium is as follows: As can be seen from the above structure, R is cyclopentadienyl, which is an organic ligand with 5 carbons and bound to Hf, and the ligand is dimethylamido, which forms a hydrolysable bond with Hf. As noted above, Cho '527 discloses that the metal in the precursor may be tin. From the disclosure of Cho '527, a person of ordinary skill in the art would have immediately envisaged a precursor having the formula R_nSnX_{4-n} wherein R is an organic ligand with 1-31 carbon atoms bound to Sn with a metal-carbon bond, $n=1-3$ and X is a ligand having a hydrolysable bond with Sn. A person of ordinary skill in the art would have been motivated to select a compound of formula (I) of Cho '527 for use as a precursor in vapor deposition because Cho '527 teaches that the ligand coordinating to the metal may be varied according to the metal to adjust a boiling point of the precursor. The organotin precursors of Cardineau Paper are compounds of Cho '527 where the metal in the precursor is tin, the ligand coordinating to the metal can be chloro(Cl^-), t-butyl (i.e. an alkyl group having a carbon atom of 4), phenyl (i.e. an aryl group having a carbon atom of 6), or allyl (i.e. an allyl group having a carbon atom of 3). Accordingly, a POSA would have been motivated to deposit the compounds of Cardineau Paper using vapor deposition methods as taught by Cho '527 because Cho '527

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	teaches that such compounds are suitable for vapor deposition and that the ligand coordinating to the metal may be varied according to the metal to adjust a boiling point of the precursor.
[1f] wherein X is selected from the group consisting of alkylamido or dialkylamido (—NR¹R², where R¹ and R² are independently hydrocarbon groups with 1-10 carbon atoms or hydrogen), siloxo (—OSiR¹R²R³, where R¹, R², R³ are independently hydrocarbon groups with 1-10 carbon atoms), silylamido (—N(SiR¹₃)(R²), where R¹ and R² are independently hydrocarbon groups with 1-10 carbon atoms), disilylamido (—N(SiR¹₃)(SiR²₃) where R¹ and R² are independently hydrocarbon groups with 1-10 carbon atoms), alkoxo and aryloxo (—OR, where R is an alkyl or aryl group with 1-10 carbon	Claim 1 lacks written description and enablement and is indefinite regarding X is “alkoxo and aryloxo” and therefore the claim is invalid. To the extent that Plaintiff argues that this is a typographical error, and should mean X is alkoxo <u>or</u> aryloxo, which is written in the alternative, so disclosure of any one of the options invalidates the claim. Then this is anticipated or rendered obvious by the Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses a structure configured to deliver a supply of an organometallic precursor (i.e. pentadimethylamido Tantalum (PDMAT)). Maeng at Figure 1:

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atoms), azido (—N_3), alkynido ($\text{—C}\equiv\text{CR}$, where R is a hydrocarbon group with 1-9 carbon atoms), amidato ($\text{—NR}^1(\text{COR}^2)$ where R^1 and R^2 are independently hydrocarbon groups with 1-7 carbon atoms or hydrogen), amidinato ($\text{—NR}^1\text{C}(\text{NR}^2)\text{R}^3$) where R^1 and R^2 are independently hydrocarbon groups with 1-8 carbon atoms or hydrogen), imido ($\text{—N}(\text{COR}^1)(\text{COR}^2)$, where R^1 and R^2 are independently hydrocarbon groups with 1-8 carbon atoms or hydrogen), or fluorinated analogues thereof, or combinations thereof	 FIG. 1. Schematic diagram for the PE-ALD system. At the time of the alleged invention, a person of ordinary skill in the art would have known that the tin-cluster disclosed in the Cardineau Paper can be formed through the hydrolysis of organotin trialkoxides and organotin trialkynes.

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	Cardineau Paper at 47: “Tin clusters have been synthesized by either the dehydration of butylstannoic acid [13], or the controlled hydration of butyltin trichloride [12], butyltin trialkoxide [16]¹ or butyltin trialkyne [17]².” Banse discloses the synthesis of tin clusters by hydrolysis of butyltin trialkoxides. Banse at 6371: “[M]onoalkyltin oxo clusters have also been prepared by the base hydrolysis of monoalkyltin trichlorides. With such a method, chloride is always present in the final compounds (i.e., $\{(BuSn)_{12}O_{14}(OH)_6\}Cl_2 \cdot 2H_2O$). Hydrolysis of metal alkoxides provide another way to synthesize oxo-hydroxo species under mild chemical conditions (organic solvents, room temperature). Moreover, this method avoids the presence of chloride in the final compounds.” <i>Id.</i> at 6372: “Water (460 μL) was slowly added to a stirred solution of $BuSn(OPr^i)_3$...” <i>Id.</i>: “To stirred $BuSn(OAm^t)_3$ was added drop by drop to a mixture of 1.98 g of water ...” <i>Id.</i> at 6379: “Hydrolysis of butyltin trialkoxides with more than three water molecules per tin yields the cage-like oxo-hydroxo butyltin cluster, $\{(BuSn)_{12}O_{14}(OH)_6\}OH_2$.” At the time of the alleged invention, a person of ordinary skill in the art would have understood that butyltin tri(iso-propoxide) ($BuSn(OPr^i)_3$) and butyltin tri(t-amyloxide) ($BuSn(OAm^t)_3$) disclosed in Banse are compounds of the formula $RSnX_3$ wherein X is an alkoxo, $-OR$, where R in the alkoxo group is isopropyl (3 carbons) or amyl (5 carbons), respectively. Jaumier discloses the synthesis of tin clusters using organotin trialkynes. Jaumier at 369: “Most metallic oxides can be prepared by the sol–gel process, the starting materials being usually metallo-organic compounds such as alkoxides. Hydrolysis and

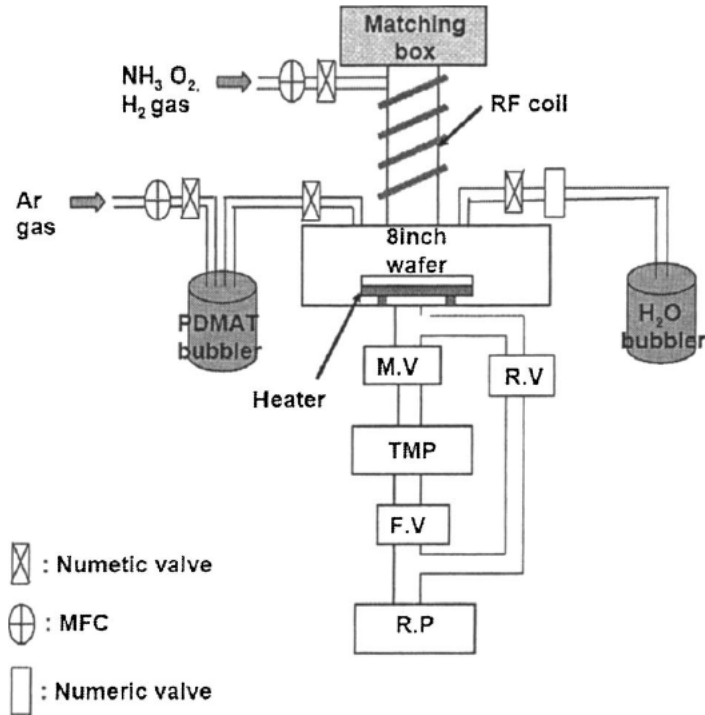
¹ Reference 16 is Banse, Frederic, et al. “Hydrolysis of monobutyltin trialkoxides: Synthesis and characterizations of $\{(BuSn)_{12}O_{14}(OH)_6\}(OH)_2$.” *Inorganic Chemistry* 34.25 (1995): 6371-6379 (“Banse”).

² Reference 17 is Jaumier, Pascale, et al. “New route to monoorganotin oxides and alkoxides from trialkynylorganotins.” *Chemical Communications* 3 (1998): 369-370 (“Jaumier”).

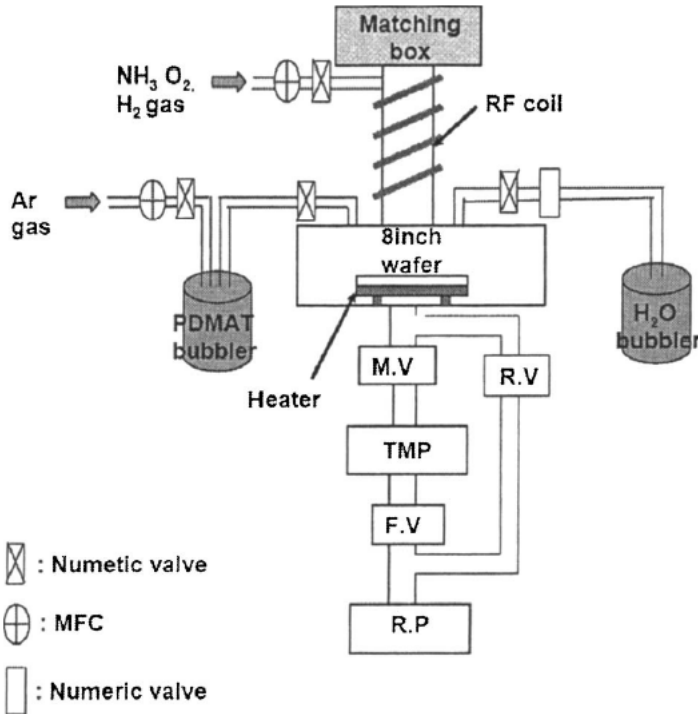
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	condensation reactions of these precursors lead to the formation of a metal–oxo based macromolecular network. ... So far, few tin based hybrids have been developed using functional organotin trialkoxides as precursors. ... Thus, other precursors, filling several requirements were sought for: they should be cleaved by water, prepared from conveniently obtained trichlorides and, finally, they should be as tolerant as possible towards functional groups. As alkynyltins are moisture sensitive compounds, alkynyl groups were thought to be good replacements for alkoxy groups. Actually, the hydrolysis of the tin–alkynyl bond is the reverse reaction of the useful access to alkynyltins by reaction of stannoxanes or alkoxyorganotins with terminal alkynes.” The organotin trialkynes tested in Jaumier were the following: Table 1 Preparation of trialkynylorganotins <table><tr><th>R¹</th><th>R²</th><th>Yield (%)^a</th></tr><tr><td>Me</td><td>Ph</td><td>71^b</td></tr><tr><td>Bu</td><td>Me</td><td>83^b</td></tr><tr><td>Bu</td><td>Bu</td><td>79^b</td></tr><tr><td>Ph</td><td>Bu</td><td>75^b</td></tr><tr><td>4-(CH₂=CH)C₆H₄(CH₂)₄</td><td>Bu</td><td>60^c</td></tr><tr><td>MeO₂C(CH₂)₂</td><td>Bu</td><td>36</td></tr><tr><td>AcO(CH₂)₃</td><td>Bu</td><td>45</td></tr><tr><td>AcO(CH₂)₅</td><td>Bu</td><td>42</td></tr><tr><td>MeCH=CHCO₂(CH₂)₅</td><td>Bu</td><td>46</td></tr></table> Jaumier at 369: “Upon hydrolysis (Scheme 2), either in chloroform with aqueous THF or in aqueous alcohols, tin–alkynyl bonds were cleaved and Sn–O–Sn bonds were formed. For alkyltrialkynyltins, R₁Sn(C≡CR₂)₃, solution ¹¹⁹Sn NMR spectroscopy of the hydrolysed product showed two equally intense sharp signals ... characteristic of the <i>closo</i> cluster [(R¹Sn)₁₂(μ³O)₁₄(μ⁴OH)₆](OH)₂... This compound was previously obtained from the hydrolysis of tris(isopropoxy)- butyltin. Thus, as these trialkynylorganotins behave similarly to the corresponding trialkoxides, alkynyl groups appear to be the viable substitutes for alkoxy groups. Moreover, substitution of the alkynyl moiety by alkyl or aryl groups has no influence on	R ¹	R ²	Yield (%) ^a	Me	Ph	71 ^b	Bu	Me	83 ^b	Bu	Bu	79 ^b	Ph	Bu	75 ^b	4-(CH ₂ =CH)C ₆ H ₄ (CH ₂) ₄	Bu	60 ^c	MeO ₂ C(CH ₂) ₂	Bu	36	AcO(CH ₂) ₃	Bu	45	AcO(CH ₂) ₅	Bu	42	MeCH=CHCO ₂ (CH ₂) ₅	Bu	46
R ¹	R ²	Yield (%) ^a																													
Me	Ph	71 ^b																													
Bu	Me	83 ^b																													
Bu	Bu	79 ^b																													
Ph	Bu	75 ^b																													
4-(CH ₂ =CH)C ₆ H ₄ (CH ₂) ₄	Bu	60 ^c																													
MeO ₂ C(CH ₂) ₂	Bu	36																													
AcO(CH ₂) ₃	Bu	45																													
AcO(CH ₂) ₅	Bu	42																													
MeCH=CHCO ₂ (CH ₂) ₅	Bu	46																													

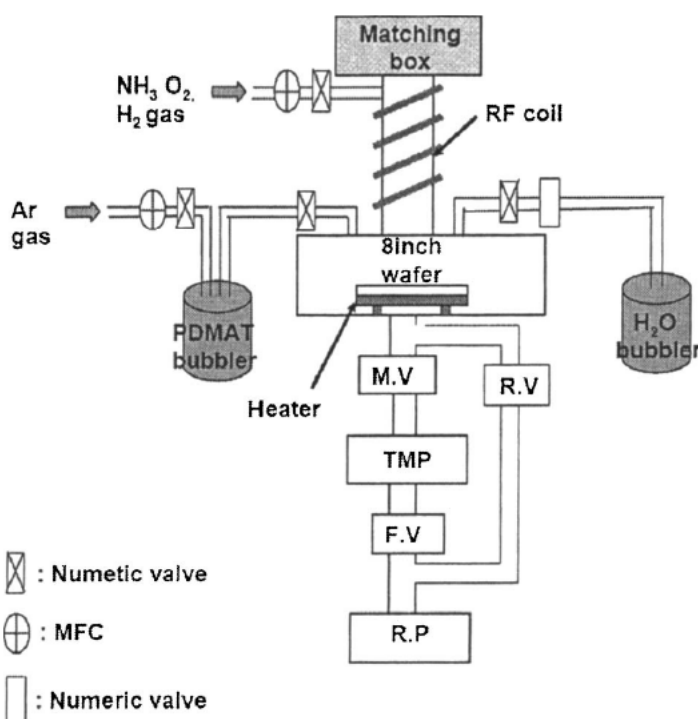
'048 Patent Claims	Disclosure of Prior Art
	the reaction as tris(phenylethynyl)-, tri(hex-1-ynyl)- and tri-(prop-1-ynyl)-butyltins were hydrolyzed at about the same rate.” At the time of the alleged invention, a person of ordinary skill in the art would have understood that the alkyltin trialkynes of Jaumier are compounds of the formula $R\text{SnX}_3$ wherein X is an alkynido ($-\text{CCR}$, where R in the alkynido group is phenyl (6 carbons), methyl (1 carbon) and butyl (4 carbons) (i.e., the R_2 groups in Jaumier). At the time of the alleged invention, a person of ordinary skill in the art would have known that alkoxo, alkylamido and dialkylamido groups were common vapor deposition metal precursor ligands and interchangeable with Cl. <i>See, e.g.,</i> Cho '527 ¶ 0053: “The ligand coordinating to the metal may be varied according to the metal to adjust a boiling point of the precursor. In example embodiments, the ligand may include a halogen such as fluoro (F^-), chloro (Cl^-), bromo (Br^-) or iodo (I^-), a hydroxyl group (OH), ammine (NH_3), an amine group having a carbon atom of about 1 to about 10, amido (NH_2) or an amido group in which an alkyl group having a carbon atom of about 1 to about 10 is substituted for a hydrogen atom, an alkoxy group having a carbon atom of about 1 to about 10.... For example, the ligand may be dimethylamido ($\text{N}(\text{CH}_3)_2$), ethyl methyl amido ($\text{NCH}_3\text{C}_2\text{H}_5$), diethylamido ($\text{N}(\text{C}_2\text{H}_5)_2$), ethyl dimethyl amine ($\text{N}(\text{CH}_3)_2\text{C}_2\text{H}_5$), diethyl methyl amine ($\text{N}(\text{C}_2\text{H}_5)_2\text{CH}_3$) or triethylamine ($\text{N}(\text{C}_2\text{H}_5)_3$).” <i>Id.</i> ¶ 0059: “For example, L_1 to L_4 may be dimethyl amido, diethyl amido, ethyl methyl amido, ethyl dimethyl amine, diethyl methyl amine or triethyl amine.” <i>See also</i> Molloy 2008 at 550: “The tin amide $\text{Sn}(\text{NMe}_2)_4$... is a volatile liquid which is thermally stable and only moderately air-sensitive, and has been used in APCVD experiments with O_2 to yield SnO_2 at temperatures lower than described above for SnCl_4 (250–400 °C).” In the alternative, a POSA would have been motivated to replace the chloro ligands of the organotin precursors of Cardineau Paper with the claimed ligands X because Cho '527 discloses that alkoxo, alkylamido and dialkylamido groups were common vapor deposition metal precursor ligands and

'048 Patent Claims	Disclosure of Prior Art
	interchangeable with Cl, and Cho '527 teaches that the ligand coordinating to the metal may be varied according to the metal to adjust a boiling point of the precursor. <i>Id.</i> ¶ 0053: “The ligand coordinating to the metal may be varied according to the metal to adjust a boiling point of the precursor. In example embodiments, the ligand may include a halogen such as fluoro (F⁻), chloro(Cl⁻), bromo (Br⁻) or iodo (I⁻), a hydroxyl group (OH), ammine (NH₃), an amine group having a carbon atom of about 1 to about 10, amido(NH₂) or an amido group in which an alkyl group having a carbon atom of about 1 to about 10 is substituted for a hydrogen atom, an alkoxy group having a carbon atom of about 1 to about 10, an alkyl group having a carbon atom of about 1 to about 10, an aryl group having a carbon atom of about 6 to about 12, an allyl group having a carbon atom of about 3 to about 15, a dienyl group having a carbon atom of about 4 to about 15, a β-diketonate group having a carbon atom of about 5 to about 20, a β-ketoiminato group having a carbon atom of about 5 to about 20 or a β-diiminato group having a carbon atom of about 5 to about 20. These may be used alone or in a mixture thereof. For example, the ligand may be dimethylamido (N(CH₃)₂), ethyl methyl amido(NCH₃C₂H₅), diethylamido(N(C₂H₅)₂), ethyl dimethyl amine(N(CH₃)₂C₂H₅), diethyl methyl amine(N(C₂H₅)₂CH₃) or triethylamine(N(C₂H₅)₃).”
[1g] structure configured to deliver flow of a first precursor vapor from the supply of the organotin compound with the inert gas as a carrier gas to the inlet	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses a structure configured to deliver flow of a first precursor vapor, e.g., a reactant. Maeng at Figure 1:

'048 Patent Claims	Disclosure of Prior Art
	 FIG. 1. Schematic diagram for the PE-ALD system. Moreover, as Inpria stated during the prosecution of the '048 Patent: 9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.”

'048 Patent Claims	Disclosure of Prior Art
	<i>Id.</i>, 5-4-2021 Response at 8: “The Drawings are amended to add elements 176, 178, and 180 to Fig. 16. The specification supports the amendment of the Drawings, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. which illustrates the apparatus for the introduction of a vapor phase (gas) reactant, as further described, for example, at page 2279 in the last paragraph of the left hand column and in the first paragraph of the Discussion on page 2280. The specification is amended to refer to the elements added to Fig. 16.” <i>Id.</i>, 1-20-2021 Response at 8: “Specifically, claim 1 is amended to specify that the apparatus comprises an inlet into the deposition chamber and structure configured to deliver flow from a supply of an inert gas. The specification supports the amendment of claim 1, for example, at page 25, line 18 via the disclosure of a separate inlet which implies an inlet. The specification further supports the amendment of claim 1, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. Claim 1 is further amended to specify ‘with the inert gas as a carrier gas to the inlet’. ... The Drawings are amended to include a Fig. 16. The specification supports Fig. 16, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. The specification is amended to refer to Fig. 16.” <i>Id.</i> at 8-9: “The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The drawings have been amended. In particular, Fig. 16 has been added to the Drawings as discussed above.”
[1h] to provide for formation of an organotin layer on the substrate surface within the deposition chamber	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses formation of films on the substrate within the deposition chamber. Maeng at Figure 1:

'048 Patent Claims	Disclosure of Prior Art
	 FIG. 1. Schematic diagram for the PE-ALD system. <i>Id.</i> at 2277: “The films were deposited on Si(100) substrates, which were cleaned by HF dipping without further cleaning step.” <i>See</i> claim 1e.
[1i] structure to deliver a second precursor vapor comprising water, hydrogen peroxide or a combination thereof	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses a structure configured to deliver flow of a second precursor vapor, wherein the second precursor is water vapor.

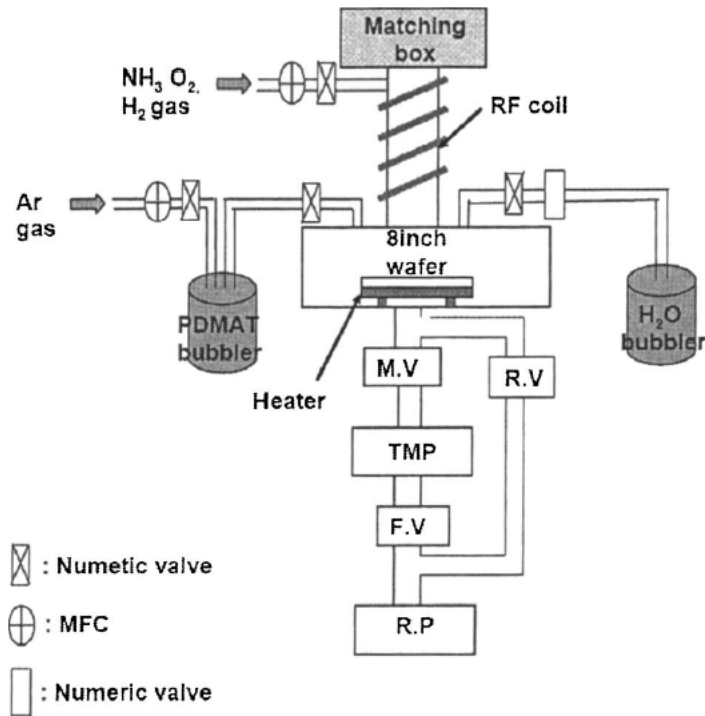
'048 Patent Claims	Disclosure of Prior Art
capable of reacting with the composition in the first precursor vapor	Maeng at Figure 1:  FIG. 1. Schematic diagram for the PE-ALD system. Moreover, as Inpria stated during the prosecution of the '048 Patent: 9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application

'048 Patent Claims	Disclosure of Prior Art
	based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.” <i>Id.</i>, 5-4-2021 Response at 8: “The Drawings are amended to add elements 176, 178, and 180 to Fig. 16. The specification supports the amendment of the Drawings, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. which illustrates the apparatus for the introduction of a vapor phase (gas) reactant, as further described, for example, at page 2279 in the last paragraph of the left hand column and in the first paragraph of the Discussion on page 2280. The specification is amended to refer to the elements added to Fig. 16.” <i>Id.</i>, 1-20-2021 Response at 8: “Specifically, claim 1 is amended to specify that the apparatus comprises an inlet into the deposition chamber and structure configured to deliver flow from a supply of an inert gas. The specification supports the amendment of claim 1, for example, at page 25, line 18 via the disclosure of a separate inlet which implies an inlet. The specification further supports the amendment of claim 1, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. Claim 1 is further amended to specify ‘with the inert gas as a carrier gas to the inlet’. ... The Drawings are amended to include a Fig. 16. The specification supports Fig. 16, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. The specification is amended to refer to Fig. 16.” <i>Id.</i> at 8-9: “The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The drawings have been amended. In particular, Fig. 16 has been added to the Drawings as discussed above.”
[1j] under conditions in the deposition chamber to form a composition with non-volatile components and a volatile component	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. It would have been a matter of routine experimentation for a POSA to set appropriate conditions in the deposition chamber to favor a reaction between an organotin precursor with hydrolysable X ligands an

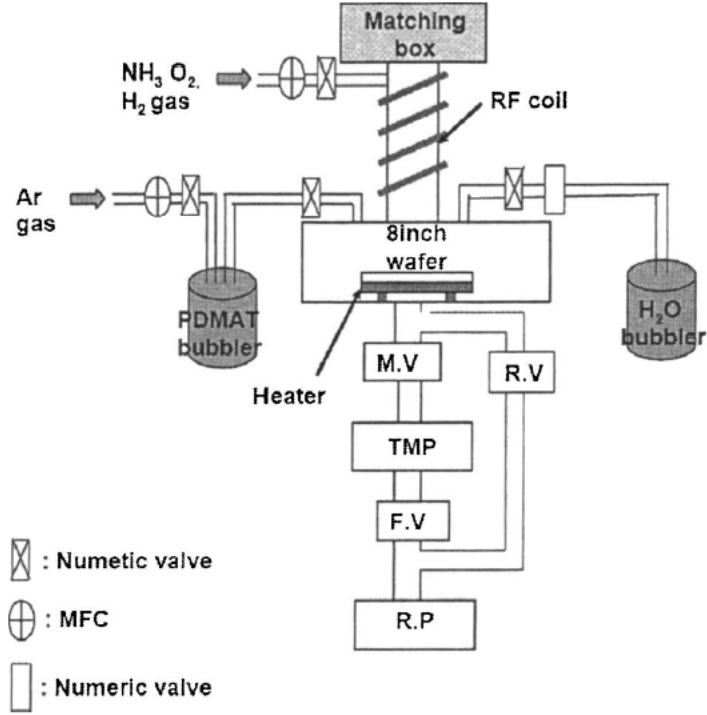
'048 Patent Claims	Disclosure of Prior Art
comprising hydrolysis reaction product with X	oxygen containing compound to form a volatile component with X ligands and a non-volatile component (tin cluster). Moreover, the specification admits that vapor deposition methods for depositing the claimed radiation patternable film were known in the art. '048 Patent at 18:14-20: "Potential vapor deposition methods include chemical vapor deposition (CVD), atomic vapor deposition (ALD), and modifications thereof, many of which have previously been employed to deposit inorganic metal oxide and nitride films with metal alkylamide, alkoxide, and halide precursors, [1-4] including SnO₂ and Sn(NMe₂)₄. [5]." <i>Id.</i> at 26:28-41: REFERENCES (INCORPORATED HEREIN BY REFERENCE) 1) Maeng, W. J.; Pak, S. J.; Kim, H. <i>J. Vac. Sci. Tech B.</i> 2006, 24, 2276. 2) Rodriguez-Reyes, J. C. F.; Teplyakov, A. V. <i>J. Appl. Phys.</i> 2008, 104, 084907. 3) Leskeld, M.; Ritala, M. <i>Thin Solid Films</i> 2002, 409, 138. 4) Leskeld, M.; Ritala, M. <i>J. Phys. IV</i> 1999, 9, Pr8-852. 5) Atagi, L. M.; Hoffman, D. M.; Liu, J. R.; Zheng, Z.; Chu, W. K.; Rubiano, R. R.; Springer, R. W.; Smith, D. C. <i>Chem. Mater.</i> 1994, 6, 360. Additionally, the '048 Patent itself does not provide any actual examples of a vapor deposition process for forming a radiation patternable film. To the extent Inpria argues that a POSA would have lacked a reasonable expectation of success because the vapor deposition method would have to be tested, that argument should be rejected. <i>See Merck & Co. v. Teva Pharm. USA, Inc.</i>, 395 F.3d 1364, 1374 (Fed.

'048 Patent Claims	Disclosure of Prior Art
	Cir. 2005) (“the district court clearly erred in finding any difference between the claimed invention and the [prior art]” where the “patent sets forth no human clinical or laboratory data showing the safety and tolerability of the treatment methods claimed by the patent” and thus “adds nothing beyond the teachings” of the prior art); <i>Hoffmann-La Roche Inc. v. Apotex Inc.</i>, 748 F.3d 1326, 1331 (Fed. Cir. 2014) (rejecting argument that prior art lacked “antifracture efficacy” data where the “patents do not themselves present data demonstrating antifracture efficacy”); <i>Alcon Research, Ltd. v. Apotex Inc.</i>, 687 F.3d 1362, 1369 (Fed. Cir. 2012) (rejecting patentee’s argument that the prior art must disclose specific data to provide a reasonable expectation of success, where the specification contained no such data).
[1k] wherein the substrate is configured with a surface to receive the non-volatile components of the composition.	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. At the time of the claimed invention, a person of ordinary skill in the art would have known that deposition chambers contain a substrate configured with a surface to receive the non-volatile components of the composition, i.e., the deposited film. Moreover, as Inpria stated during the prosecution of the '048 Patent: 9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.” <i>Id.</i>, 5-4-2021 Response at 8: “The Drawings are amended to add elements 176, 178, and 180 to Fig. 16. The specification supports the amendment of the Drawings, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. I of Maeng et al. which illustrates the apparatus for the introduction of a vapor phase (gas) reactant, as further described, for example, at page 2279 in the last paragraph of the left hand column and

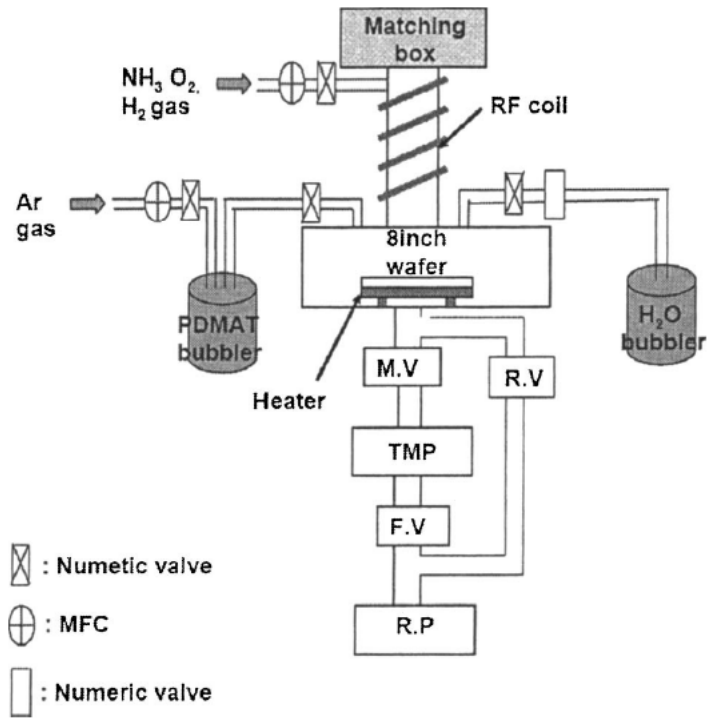
'048 Patent Claims	Disclosure of Prior Art
	in the first paragraph of the Discussion on page 2280. The specification is amended to refer to the elements added to Fig. 16.” <i>Id.</i>, 1-20-2021 Response at 8: “Specifically, claim 1 is amended to specify that the apparatus comprises an inlet into the deposition chamber and structure configured to deliver flow from a supply of an inert gas. The specification supports the amendment of claim 1, for example, at page 25, line 18 via the disclosure of a separate inlet which implies an inlet. The specification further supports the amendment of claim 1, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. Claim 1 is further amended to specify ‘with the inert gas as a carrier gas to the inlet’. ... The Drawings are amended to include a Fig. 16. The specification supports Fig. 16, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. The specification is amended to refer to Fig. 16.” <i>Id.</i> at 8-9: “The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The drawings have been amended. In particular, Fig. 16 has been added to the Drawings as discussed above.”
Claim 2	
The system of claim 1 wherein the substrate comprises a silicon wafer.	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. A person of ordinary skill in the art would have been motivated to use a silicon wafer. <i>See, e.g.</i>, Lam ’416 at 5:40-45: “In this application, the terms ‘semiconductor wafer,’ ‘wafer,’ ‘substrate,’ ‘wafer substrate,’ and ‘partially fabricated integrated circuit’ are used interchangeably. One of ordinary skill in the art would understand that the term ‘partially fabricated integrated circuit’ can refer to a silicon wafer during any of many stages of integrated circuit fabrication thereon.”
Claim 3	

'048 Patent Claims	Disclosure of Prior Art
The system of claim 1 wherein the inert gas comprises nitrogen or argon.	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses argon as the inert gas: Maeng at Figure 1:  FIG. 1. Schematic diagram for the PE-ALD system. Moreover, as Inpria stated during the prosecution of the '048 Patent:

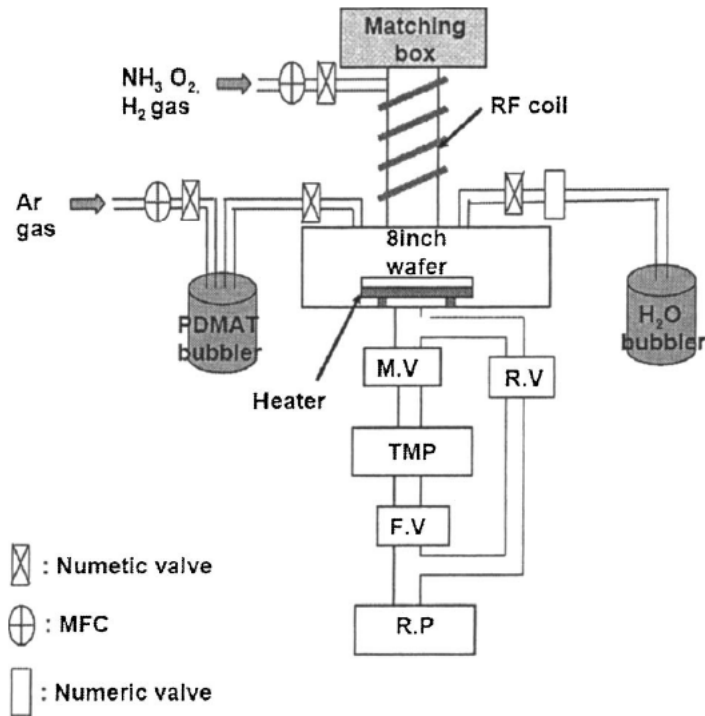
'048 Patent Claims	Disclosure of Prior Art
	9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.” <i>Id.</i>, 5-4-2021 Response at 8: “The Drawings are amended to add elements 176, 178, and 180 to Fig. 16. The specification supports the amendment of the Drawings, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. which illustrates the apparatus for the introduction of a vapor phase (gas) reactant, as further described, for example, at page 2279 in the last paragraph of the left hand column and in the first paragraph of the Discussion on page 2280. The specification is amended to refer to the elements added to Fig. 16.” <i>Id.</i>, 1-20-2021 Response at 8: “Specifically, claim 1 is amended to specify that the apparatus comprises an inlet into the deposition chamber and structure configured to deliver flow from a supply of an inert gas. The specification supports the amendment of claim 1, for example, at page 25, line 18 via the disclosure of a separate inlet which implies an inlet. The specification further supports the amendment of claim 1, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. Claim 1 is further amended to specify ‘with the inert gas as a carrier gas to the inlet’. ... The Drawings are amended to include a Fig. 16. The specification supports Fig. 16, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. The specification is amended to refer to Fig. 16.” <i>Id.</i> at 8-9: “The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The drawings have been amended. In particular, Fig. 16 has been added to the Drawings as discussed above.”
Claim 4	

'048 Patent Claims	Disclosure of Prior Art
The system of claim 1 wherein the structure configured to deliver flow comprises an aerosol generator configured to generate an aerosol from a liquid comprising the organotin compound, a vaporization chamber configured to receive an injection of organotin compound, a flash evaporator configured to evaporate the organotin compound, <u>or</u> a bubbler configured for bubbling an inert carrier gas through a liquid comprising the organotin compound, and	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses a bubbler to generate a vapor of the precursor compounds. Maeng at Figure 1:  FIG. 1. Schematic diagram for the PE-ALD system. Moreover, as Inpria stated during the prosecution of the '048 Patent:

'048 Patent Claims	Disclosure of Prior Art
	9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.” <i>Id.</i>, 5-4-2021 Response at 8: “The Drawings are amended to add elements 176, 178, and 180 to Fig. 16. The specification supports the amendment of the Drawings, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. which illustrates the apparatus for the introduction of a vapor phase (gas) reactant, as further described, for example, at page 2279 in the last paragraph of the left hand column and in the first paragraph of the Discussion on page 2280. The specification is amended to refer to the elements added to Fig. 16.” <i>Id.</i>, 1-20-2021 Response at 8: “Specifically, claim 1 is amended to specify that the apparatus comprises an inlet into the deposition chamber and structure configured to deliver flow from a supply of an inert gas. The specification supports the amendment of claim 1, for example, at page 25, line 18 via the disclosure of a separate inlet which implies an inlet. The specification further supports the amendment of claim 1, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. Claim 1 is further amended to specify ‘with the inert gas as a carrier gas to the inlet’. ... The Drawings are amended to include a Fig. 16. The specification supports Fig. 16, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. The specification is amended to refer to Fig. 16.” <i>Id.</i> at 8-9: “The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The drawings have been amended. In particular, Fig. 16 has been added to the Drawings as discussed above.”

'048 Patent Claims	Disclosure of Prior Art
wherein the deposition on the surface of the substrate comprises chemical vapor deposition.	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses an ALD system: Maeng at Figure 1:  FIG. 1. Schematic diagram for the PE-ALD system. Moreover, as Inpria stated during the prosecution of the '048 Patent:

'048 Patent Claims	Disclosure of Prior Art
	9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.” <i>Id.</i>, 5-4-2021 Response at 8: “The Drawings are amended to add elements 176, 178, and 180 to Fig. 16. The specification supports the amendment of the Drawings, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. which illustrates the apparatus for the introduction of a vapor phase (gas) reactant, as further described, for example, at page 2279 in the last paragraph of the left hand column and in the first paragraph of the Discussion on page 2280. The specification is amended to refer to the elements added to Fig. 16.” <i>Id.</i>, 1-20-2021 Response at 8: “Specifically, claim 1 is amended to specify that the apparatus comprises an inlet into the deposition chamber and structure configured to deliver flow from a supply of an inert gas. The specification supports the amendment of claim 1, for example, at page 25, line 18 via the disclosure of a separate inlet which implies an inlet. The specification further supports the amendment of claim 1, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. Claim 1 is further amended to specify ‘with the inert gas as a carrier gas to the inlet’. ... The Drawings are amended to include a Fig. 16. The specification supports Fig. 16, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. The specification is amended to refer to Fig. 16.” <i>Id.</i> at 8-9: “The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The drawings have been amended. In particular, Fig. 16 has been added to the Drawings as discussed above.”
Claim 5	

'048 Patent Claims	Disclosure of Prior Art
The system of claim 1 wherein the second precursor vapor comprises water vapor.	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses water vapor as the co-reactant. Maeng at Figure 1:  FIG. 1. Schematic diagram for the PE-ALD system. Moreover, as Inpria stated during the prosecution of the '048 Patent:

'048 Patent Claims	Disclosure of Prior Art
	9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.” <i>Id.</i>, 5-4-2021 Response at 8: “The Drawings are amended to add elements 176, 178, and 180 to Fig. 16. The specification supports the amendment of the Drawings, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. which illustrates the apparatus for the introduction of a vapor phase (gas) reactant, as further described, for example, at page 2279 in the last paragraph of the left hand column and in the first paragraph of the Discussion on page 2280. The specification is amended to refer to the elements added to Fig. 16.” <i>Id.</i>, 1-20-2021 Response at 8: “Specifically, claim 1 is amended to specify that the apparatus comprises an inlet into the deposition chamber and structure configured to deliver flow from a supply of an inert gas. The specification supports the amendment of claim 1, for example, at page 25, line 18 via the disclosure of a separate inlet which implies an inlet. The specification further supports the amendment of claim 1, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. Claim 1 is further amended to specify ‘with the inert gas as a carrier gas to the inlet’. ... The Drawings are amended to include a Fig. 16. The specification supports Fig. 16, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. The specification is amended to refer to Fig. 16.” <i>Id.</i> at 8-9: “The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The drawings have been amended. In particular, Fig. 16 has been added to the Drawings as discussed above.”
Claim 6	

'048 Patent Claims	Disclosure of Prior Art
The system of claim 1 further comprising a flow comprising a third precursor vapor comprising a composition represented by the formula ML_v, where v is $2 \leq v \leq 6$ and L is an oxidizable ligand or a ligand having a hydrolysable M-L bond or a combination thereof, and M is a metal selected from groups 2-16 of the periodic table.	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. At the time of the alleged invention, a person of ordinary skill in the art would have known it was routine practice to conduct vapor deposition with more than one type of metal precursor. <i>See, e.g.,</i> Dussarrat '927 ¶ 0016: "Also disclosed are methods of forming a hafnium- or zirconium-containing layer on a substrate disposed in a reactor. A vapor comprising at least one compound of any one of the disclosed compounds is introduced into the reactor. The hafnium- or zirconium-containing layer is formed on the substrate using a vapor deposition process. The disclosed method may include one or more of the following aspects: introducing into the reactor a vapor comprising at least one second precursor; a metal of the at least one second precursor being selected from the group consisting of Ti, Ta, Bi, Hf, Zr, Pb, Nb, Mg, Al, Sr, Y, Ba, Ca, lanthanides, and combinations thereof ..." Cho '527 ¶ 0018: "According to some example embodiments, a first precursor including a first metal and a first ligand chelating to the first metal may be provided onto a substrate. A second precursor including a second metal and a second ligand chelating to the second metal may be provided onto the substrate." At the time of the claimed invention, a person of ordinary skill in the art would have known that tin tetrachloride and tetrakis(dimethylamido)tin were common vapor deposition precursors. Van Mol 2003 at 95: "The most common tin precursor to produce tin oxide coatings are monobutyltin trichloride (MBTC), tin tetrachloride (TTC), and dimethyltin dichloride." <i>Id.</i> at 13: "Tin oxide thin films have some very beneficial properties, such as transparency for visible light, reflectivity for infrared light, and a low electrical sheet resistance, making them suitable for a wide variety of applications as low-E coatings on glass, gas sensors, and electrodes in solar cells. One of the major production techniques is chemical vapour deposition (CVD). It has the advantage to be used in a continuous process for depositing uniform, homogeneous coatings on large surface areas at high deposition rates. Possible precursors are $SnCl_4$, $Sn(CH_3)_4$,

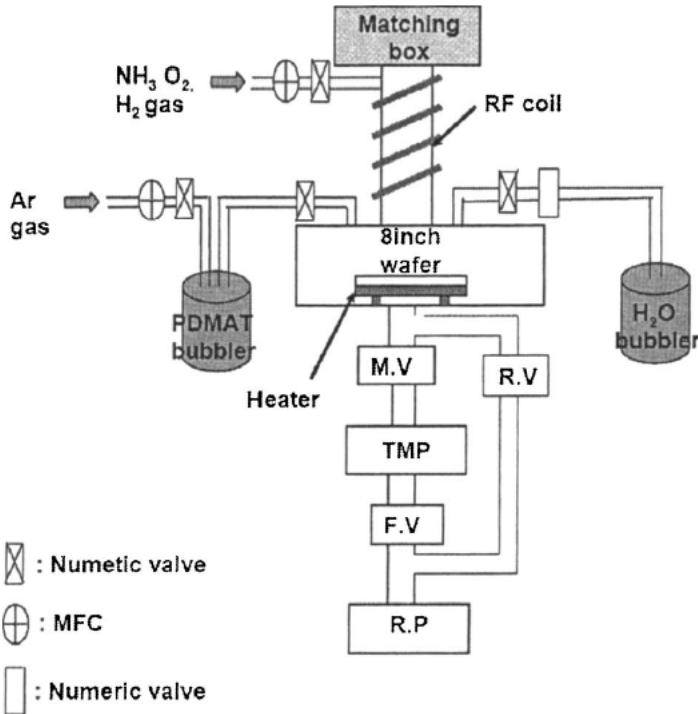
'048 Patent Claims	Disclosure of Prior Art
	(CH₃)₂SnCl₂, Sn(C₄H₉)₂(CH₃COO)₂, and (C₄H₉)SnCl₃. By oxidation with O₂ or hydrolysis with H₂O, these precursors form a SnO₂ layer.” Van Mol 2006 at 72: “Although it is possible to deposit tin oxide from many different organometallic precursors [2], the ones most commonly used industrially are tin tetrachloride (SnCl₄, TTC), dimethyltin dichloride ((CH₃)₂SnCl₂, DMTC) [3–7] and monobutyltin trichloride (n-C₄H₉SnCl₃, MBTC) [8,9].” Molloy 2008 at 550: “The tin amide Sn(NMe₂)₄ ... is a volatile liquid which is thermally stable and only moderately air-sensitive, and has been used in APCVD experiments with O₂ to yield SnO₂ at temperatures lower than described above for SnCl₄ (250–400 °C).”
Claim 7	
The system of claim 6 wherein the third precursor vapor comprises SnL₄.	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. At the time of the claimed invention, a person of ordinary skill in the art would have known that tin tetrachloride and tetrakis(dimethylamido)tin were common vapor deposition precursors. Van Mol 2003 at 95: “The most common tin precursor to produce tin oxide coatings are monobutyltin trichloride (MBTC), tin tetrachloride (TTC), and dimethyltin dichloride.” <i>Id.</i> at 13: “Tin oxide thin films have some very beneficial properties, such as transparency for visible light, reflectivity for infrared light, and a low electrical sheet resistance, making them suitable for a wide variety of applications as low-E coatings on glass, gas sensors, and electrodes in solar cells. One of the major production techniques is chemical vapour deposition (CVD). It has the advantage to be used in a continuous process for depositing uniform, homogeneous coatings on large surface areas at high deposition rates. Possible precursors are SnCl₄, Sn(CH₃)₄, (CH₃)₂SnCl₂, Sn(C₄H₉)₂(CH₃COO)₂, and (C₄H₉)SnCl₃. By oxidation with O₂ or hydrolysis with H₂O, these precursors form a SnO₂ layer.”

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	Van Mol 2006 at 72: “Although it is possible to deposit tin oxide from many different organometallic precursors [2], the ones most commonly used industrially are tin tetrachloride (SnCl₄, TTC), dimethyltin dichloride ((CH₃)₂SnCl₂, DMTC) [3–7] and monobutyltin trichloride (n-C₄H₉SnCl₃, MBTC) [8,9].” Molloy 2008 at 550: “The tin amide Sn(NMe₂)₄ ... is a volatile liquid which is thermally stable and only moderately air-sensitive, and has been used in APCVD experiments with O₂ to yield SnO₂ at temperatures lower than described above for SnCl₄ (250–400 °C).”
Claim 8	
The system of claim 1 wherein the interior has a pressure from about 0.01 Torr to about 25 Torr.	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng at 2277: “With these flow, the chamber pressure during reactant exposure increased to about 10 mTorr at standard growth condition.” Moreover, as Inpria stated during the prosecution of the '048 Patent: 9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.”
Claim 9	
The system of claim 1 wherein the interior has a temperature from about 40° C. to about 175° C.	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses reaction temperatures ranging from 150 to 250 °C.

'048 Patent Claims	Disclosure of Prior Art
	Maeng at 2277: “PE-ALD has shown broader temperature range than thermal ALD (data not shown) due to the presence of radicals (mostly oxygen atoms in this case) leading to higher reactivity. This region is 200–250 °C for thermal ALD and 150–250 °C for PE-ALD.” Moreover, as Inpria stated during the prosecution of the '048 Patent: 9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.” A person of ordinary skill in the art would have been motivated to conduct vapor deposition under conditions that limit de-alkylation (i.e., tin-carbon bond cleavage) of the organotin cluster in light of the Cardineau Paper’s teaching that resist sensitivity is dependent on the photolysis of the tin-carbon bond in the cluster. Cardineau at 48: “the resist sensitivity was also found to correlate directly with the organic ligand (R) bond energy” supporting “a mechanism of organic ligand (R) photolysis, activating the clusters for agglomeration and resulting in the observed the negative-tone imaging properties.” A person of ordinary skill in the art would have known that tin-carbon bonds are relatively stable at temperatures below 175 °C. Therefore, a person of ordinary skill in the art would have been motivated with a reasonable expectation of success to maintain the deposition temperature below 175 °C in order to prevent tin-carbon bond cleavage. Blunden at 159: “The organotins are less stable than previously believed since evidence for degradation was obtained in many cases at approximately 160-170 °C.” De Stefano 2000 at 213: “the tin-carbon bond is reported to be stable up to 200 °C.”

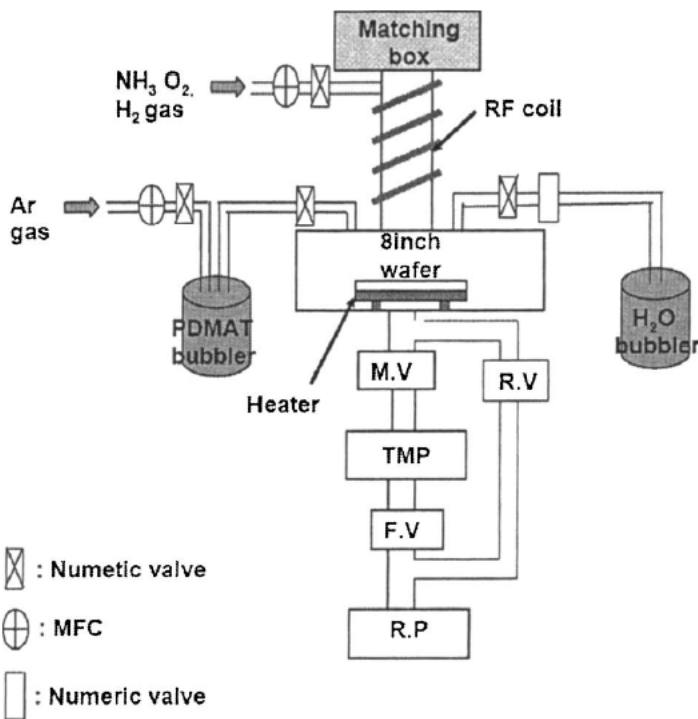
'048 Patent Claims	Disclosure of Prior Art
	Valla at 507: “The Sn-C bonds are stable in the presence of water, atmospheric O₂ and heat at temperatures up to 200 °C, so thermal decomposition has no significance under environmental conditions.”
Claim 10	
The system of claim 1 comprising a configuration providing for selection of the pressure and/or the temperature in the deposition chamber.	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses a configuration providing for selection of the pressure and/or the temperature in the deposition chamber. Maeng at 2277: “With these flow, the chamber pressure during reactant exposure increased to about 10 mTorr at standard growth condition.” Moreover, as Inpria stated during the prosecution of the '048 Patent: 9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.” <i>Id.</i>, 5-4-2021 Response at 8: “The Drawings are amended to add elements 176, 178, and 180 to Fig. 16. The specification supports the amendment of the Drawings, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. I of Maeng et al. which illustrates the apparatus for the introduction of a vapor phase (gas) reactant, as further described, for example, at page 2279 in the last paragraph of the left hand column and in the first paragraph of the Discussion on page 2280. The specification is amended to refer to the elements added to Fig. 16.”

'048 Patent Claims	Disclosure of Prior Art
	<i>Id.</i>, 1-20-2021 Response at 8: “Specifically, claim 1 is amended to specify that the apparatus comprises an inlet into the deposition chamber and structure configured to deliver flow from a supply of an inert gas. The specification supports the amendment of claim 1, for example, at page 25, line 18 via the disclosure of a separate inlet which implies an inlet. The specification further supports the amendment of claim 1, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. Claim 1 is further amended to specify ‘with the inert gas as a carrier gas to the inlet’. ... The Drawings are amended to include a Fig. 16. The specification supports Fig. 16, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. The specification is amended to refer to Fig. 16.” <i>Id.</i> at 8-9: “The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The drawings have been amended. In particular, Fig. 16 has been added to the Drawings as discussed above.”
Claim 14 The system of claim 1 wherein a first vapor inputting structure is configured to deliver a first vapor flow and a second vapor inputting structure is configured to deliver a second vapor flow at the same time.	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses wherein a first vapor inputting structure is configured to deliver a first vapor flow and a second vapor inputting structure is configured to deliver a second vapor flow at the same time. Maeng discloses mass flow controllers (MFC) which control the delivery of a first vapor flow and the delivery of a second vapor flow. A person of ordinary skill in the art would have known that the MFCs can be configured to deliver a first vapor flow and to deliver a second vapor flow at the same time.

'048 Patent Claims	Disclosure of Prior Art
	 FIG. 1. Schematic diagram for the PE-ALD system. Maeng at 2277: “Ar was used as carrier and purging gas and the flow was controlled by mass flow controller (MFC) upstream to the main chamber. The flow rates were set as 50 sccm for carrier gas and 75 sccm for purging gas, respectively. Also, the flows of NH₃, H₂, and O₂ were all controlled by MFC while the flow of water vapor was controlled by leak valve. Although Maeng operates the disclosed system in ALD mode (<i>see</i> Maeng at Figure 1), it would be a matter of routine optimization for a person of ordinary skill in the art to operate the system in CVD mode, i.e., wherein a first vapor inputting structure is configured to deliver a first vapor flow and a second vapor inputting structure is configured to deliver a second vapor flow at the same time.

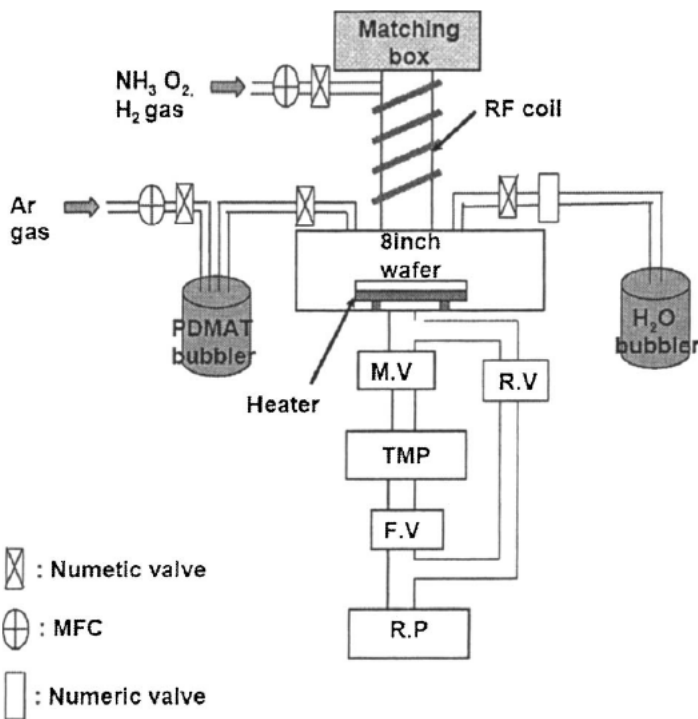
'048 Patent Claims	Disclosure of Prior Art
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	<i>Id.</i> at 8-9: “The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The drawings have been amended. In particular, Fig. 16 has been added to the Drawings as discussed above.”
Claim 15	
The system of claim 1 wherein a first vapor inputting structure is configured to deliver a first vapor flow and a second vapor inputting structure is configured to deliver a second vapor flow, wherein the first vapor flow and the second vapor flow are sequential.	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses wherein a first vapor inputting structure is configured to deliver a first vapor flow and a second vapor inputting structure is configured to deliver a second vapor flow, wherein the first vapor flow and the second vapor flow are sequential. Maeng discloses mass flow controllers (MFC) which control the delivery of a first vapor flow and the delivery of a second vapor flow. A person of ordinary skill in the art would have known that the MFCs can be configured to deliver a first vapor flow and to deliver a second vapor flow, wherein the first vapor flow and the second vapor flow are sequential.

'048 Patent Claims	Disclosure of Prior Art
	 FIG. 1. Schematic diagram for the PE-ALD system. Maeng at 2277: “Ar was used as carrier and purging gas and the flow was controlled by mass flow controller (MFC) upstream to the main chamber. The flow rates were set as 50 sccm for carrier gas and 75 sccm for purging gas, respectively. Also, the flows of NH₃, H₂, and O₂ were all controlled by MFC while the flow of water vapor was controlled by leak valve. Maeng operates the disclosed system in ALD mode (<i>see</i> Maeng at Figure 1), i.e., wherein a first vapor inputting structure is configured to deliver a first vapor flow and a second vapor inputting structure is configured to deliver a second vapor flow, wherein the first vapor flow and the second vapor flow are sequential.

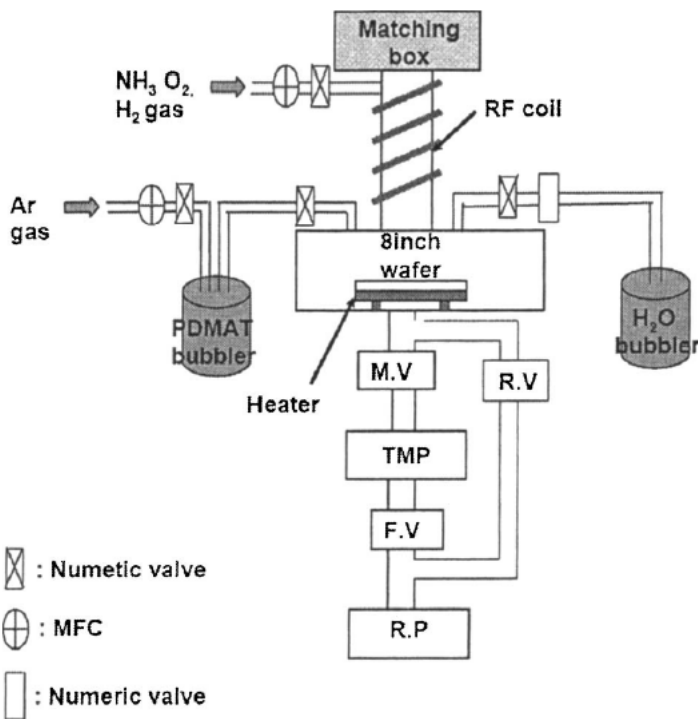
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	<i>Id.</i> at 8-9: “The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The drawings have been amended. In particular, Fig. 16 has been added to the Drawings as discussed above.”
Claim 16	
The system of claim 1 wherein a first vapor inputting structure is configured to deliver a first vapor flow and a second vapor inputting structure is configured to deliver a second vapor flow, wherein the first vapor flow, the second vapor flow, and a third vapor flow are sequential.	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses wherein a first vapor inputting structure is configured to deliver a first vapor flow and a second vapor inputting structure is configured to deliver a second vapor flow, wherein the first vapor flow, the second vapor flow, and a third vapor flow are sequential. Maeng discloses mass flow controllers (MFC) which control the delivery of a first vapor flow and the delivery of a second vapor flow. A person of ordinary skill in the art would have known that the MFCs can be configured to deliver a first vapor flow and deliver a second vapor flow, wherein the first vapor flow, the second vapor flow, and a third vapor flow are sequential.

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	 FIG. 1. Schematic diagram for the PE-ALD system. Maeng at 2277: “Ar was used as carrier and purging gas and the flow was controlled by mass flow controller (MFC) upstream to the main chamber. The flow rates were set as 50 sccm for carrier gas and 75 sccm for purging gas, respectively. Also, the flows of NH₃, H₂, and O₂ were all controlled by MFC while the flow of water vapor was controlled by leak valve. Maeng operates the disclosed system in ALD mode (<i>see</i> Maeng at Figure 1), i.e., wherein a first vapor inputting structure is configured to deliver a first vapor flow and a second vapor inputting structure is configured to deliver a second vapor flow, wherein the first vapor flow, the second vapor flow, and a third vapor flow are sequential.

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	Moreover, as Inpria stated during the prosecution of the '048 Patent: 9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.” <i>Id.</i>, 5-4-2021 Response at 8: “The Drawings are amended to add elements 176, 178, and 180 to Fig. 16. The specification supports the amendment of the Drawings, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. which illustrates the apparatus for the introduction of a vapor phase (gas) reactant, as further described, for example, at page 2279 in the last paragraph of the left hand column and in the first paragraph of the Discussion on page 2280. The specification is amended to refer to the elements added to Fig. 16.” <i>Id.</i>, 1-20-2021 Response at 8: “Specifically, claim 1 is amended to specify that the apparatus comprises an inlet into the deposition chamber and structure configured to deliver flow from a supply of an inert gas. The specification supports the amendment of claim 1, for example, at page 25, line 18 via the disclosure of a separate inlet which implies an inlet. The specification further supports the amendment of claim 1, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. Claim 1 is further amended to specify ‘with the inert gas as a carrier gas to the inlet’. ... The Drawings are amended to include a Fig. 16. The specification supports Fig. 16, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. The specification is amended to refer to Fig. 16.”

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	<i>Id.</i> at 8-9: “The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The drawings have been amended. In particular, Fig. 16 has been added to the Drawings as discussed above.”
Claim 17	
The system of claim 1 wherein a first vapor inputting structure is configured to deliver a first vapor flow and a second vapor inputting structure is configured to deliver a second vapor flow, wherein the first vapor flow and the second vapor flow are at the same time and a third vapor flow is sequential.	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses wherein a first vapor inputting structure is configured to deliver a first vapor flow and a second vapor inputting structure is configured to deliver a second vapor flow, wherein the first vapor flow and the second vapor flow are at the same time and a third vapor flow is sequential. Maeng discloses mass flow controllers (MFC) which control the delivery of a first vapor flow and the delivery of a second vapor flow. A person of ordinary skill in the art would have known that the MFCs can be configured to deliver a first vapor flow and deliver a second vapor flow, wherein the first vapor flow and the second vapor flow are at the same time and a third vapor flow is sequential.

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	 FIG. 1. Schematic diagram for the PE-ALD system. Maeng at 2277: “Ar was used as carrier and purging gas and the flow was controlled by mass flow controller (MFC) upstream to the main chamber. The flow rates were set as 50 sccm for carrier gas and 75 sccm for purging gas, respectively. Also, the flows of NH₃, H₂, and O₂ were all controlled by MFC while the flow of water vapor was controlled by leak valve. Maeng operates the disclosed system in ALD mode (<i>see</i> Maeng at Figure 1), i.e., wherein a first vapor inputting structure is configured to deliver a first vapor flow and a second vapor inputting structure is configured to deliver a second vapor flow, wherein the first vapor flow and the second vapor flow are at the same time and a third vapor flow is sequential.

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	Moreover, as Inpria stated during the prosecution of the '048 Patent: 9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.” <i>Id.</i>, 5-4-2021 Response at 8: “The Drawings are amended to add elements 176, 178, and 180 to Fig. 16. The specification supports the amendment of the Drawings, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. which illustrates the apparatus for the introduction of a vapor phase (gas) reactant, as further described, for example, at page 2279 in the last paragraph of the left hand column and in the first paragraph of the Discussion on page 2280. The specification is amended to refer to the elements added to Fig. 16.” <i>Id.</i>, 1-20-2021 Response at 8: “Specifically, claim 1 is amended to specify that the apparatus comprises an inlet into the deposition chamber and structure configured to deliver flow from a supply of an inert gas. The specification supports the amendment of claim 1, for example, at page 25, line 18 via the disclosure of a separate inlet which implies an inlet. The specification further supports the amendment of claim 1, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. Claim 1 is further amended to specify ‘with the inert gas as a carrier gas to the inlet’. ... The Drawings are amended to include a Fig. 16. The specification supports Fig. 16, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. The specification is amended to refer to Fig. 16.”

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	<i>Id.</i> at 8-9: “The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The drawings have been amended. In particular, Fig. 16 has been added to the Drawings as discussed above.”
Claim 18	
The system of claim 1 wherein the interior has a temperature from about 45° C. to about 200° C.	Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified, discloses and/or suggests this claim limitation. Maeng discloses reaction temperatures ranging from 150 to 250 °C. Maeng at 2277: “PE-ALD has shown broader temperature range than thermal ALD (data not shown) due to the presence of radicals (mostly oxygen atoms in this case) leading to higher reactivity. This region is 200–250 °C for thermal ALD and 150–250 °C for PE-ALD.” Moreover, as Inpria stated during the prosecution of the '048 Patent: 9-15-2022 Pre-Appeal Brief at 12: “Maeng is the reference referred to by Appellant in their specification as a model for the basic components of the apparatus structure” claimed. <i>Id.</i> at 10: “Applicant has also noted that configurations to control pressure, flow and temperature in a chamber are well-known in the art. Specific embodiments were included in the application based on an incorporation by reference, which was an option contemplated when including the incorporation by reference.” <i>Id.</i>, 5-4-2021 Response at 8: “The Drawings are amended to add elements 176, 178, and 180 to Fig. 16. The specification supports the amendment of the Drawings, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. I of Maeng et al. which illustrates the apparatus for the introduction of a vapor phase (gas) reactant, as further described, for example, at page 2279 in the last paragraph of the left hand column and in the first paragraph of the Discussion on page 2280. The specification is amended to refer to the elements added to Fig. 16.”

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	<i>Id.</i>, 1-20-2021 Response at 8: “Specifically, claim 1 is amended to specify that the apparatus comprises an inlet into the deposition chamber and structure configured to deliver flow from a supply of an inert gas. The specification supports the amendment of claim 1, for example, at page 25, line 18 via the disclosure of a separate inlet which implies an inlet. The specification further supports the amendment of claim 1, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. Claim 1 is further amended to specify ‘with the inert gas as a carrier gas to the inlet’. ... The Drawings are amended to include a Fig. 16. The specification supports Fig. 16, for example, at page 36, line 4, via the incorporation by reference of Maeng et al. Applicant refers in particular to Fig. 1 of Maeng et al. The specification is amended to refer to Fig. 16.” <i>Id.</i> at 8-9: “The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The drawings have been amended. In particular, Fig. 16 has been added to the Drawings as discussed above.”
Claim 19	
The system of claim 1 wherein X is alkylamido or dialkylamido.	At the time of the alleged invention, a person of ordinary skill in the art would have known that alkylamido and dialkylamido groups were common vapor deposition metal precursor ligands and interchangeable with Cl. <i>See, e.g.</i>, Cho ’527 ¶ 0053: “The ligand coordinating to the metal may be varied according to the metal to adjust a boiling point of the precursor. In example embodiments, the ligand may include a halogen such as fluoro (F⁻), chloro(Cl⁻), bromo (Br⁻) or iodo (I⁻), a hydroxyl group (OH), ammine (NH₃), an amine group having a carbon atom of about 1 to about 10, amido(NH₂) or an amido group in which an alkyl group having a carbon atom of about 1 to about 10 is substituted for a hydrogen atom, an alkoxy group having a carbon atom of about 1 to about 10.... For example, the ligand may be dimethylamido (N(CH₃)₂), ethyl methyl amido(NCH₃C₂H₅), diethylamido(N(C₂H₅)₂), ethyl dimethyl amine(N(CH₃)₂C₂H₅), diethyl methyl amine(N(C₂H₅)₂CH₃) or triethylamine(N(C₂H₅)₃).” <i>Id.</i> ¶ 0059: “For example, L₁ to L₄ may be dimethyl amido, diethyl amido, ethyl methyl amido, ethyl dimethyl amine, diethyl methyl amine or triethyl amine.”

'048 Patent Claims	Disclosure of Prior Art
	A person of ordinary skill in the art would have been motivated to make the tin cluster with an organotin alkylamido or dialkylamido instead of an organotin trichloride. <i>See, e.g.,</i> Maeng at 2276: “Among various precursors for ALD, alkylamide precursors have attracted great interests since they have high vapor pressures and Cl⁻ and O-free ligands. Moreover, ALD from alkyamide is processed at relatively lower growth temperatures producing noncorrosive products. Especially, alkylamide precursor such as pentakis-(dimethylamino)Ta (PDMAT) or tetrakis-(dimethylamino)Ti (TDMAT) has been extensively studied for deposition of TaN or TiN.” <i>See also</i> Molloy 2008 at 550: “The tin amide Sn(NMe₂)₄ ... is a volatile liquid which is thermally stable and only moderately air-sensitive, and has been used in APCVD experiments with O₂ to yield SnO₂ at temperatures lower than described above for SnCl₄ (250–400 °C).”
Claim 20	
The system of claim 1 wherein X is alkoxo and aryloxo.	Claim 1 lacks written description and enablement and is indefinite regarding X is “alkoxo and aryloxo” and therefore the claim is invalid. To the extent that Plaintiff argues that this is a typographical error, and should mean X is alkoxo or aryloxo, which is written in the alternative, so disclosure of any one of the options invalidates the claim. Then this is anticipated or rendered obvious by the Maeng, alone, in combination with the general knowledge of a person of ordinary skill in the art, and/or in combination with the other references identified herein, which discloses and/or suggests this claim element. At the time of the alleged invention, a person of ordinary skill in the art would have known that the tin-cluster disclosed in the Cardineau Paper can be formed through the hydrolysis of organotin alkoxides. <i>See</i> Claim 1 (discussing Banse). A person of ordinary skill in the art would have been motivated to make the tin cluster with an organotin alkoxide instead of an organotin trichloride so as to not have chloride contamination in the final product.

'048 Patent Claims	Disclosure of Prior Art
	<i>See, e.g.,</i> Banse at 6371: “Hydrolysis of metal alkoxides provide another way to synthesize oxo-hydroxo species under mild chemical conditions (organic solvents, room temperature). Moreover, this method avoids the presence of chloride in the final compounds.”