Exhibit 4

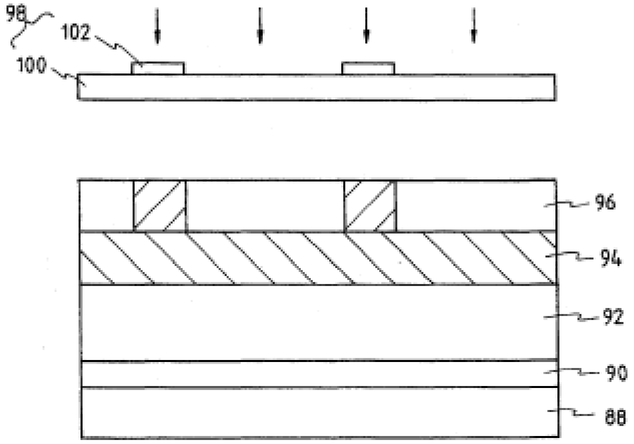
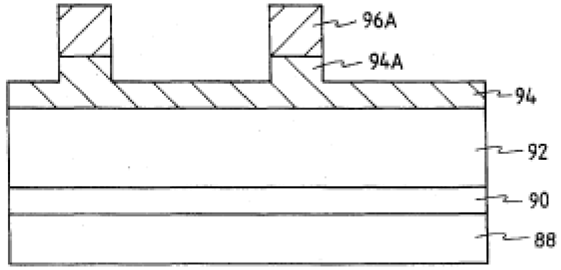
STC.UNM v. Intel

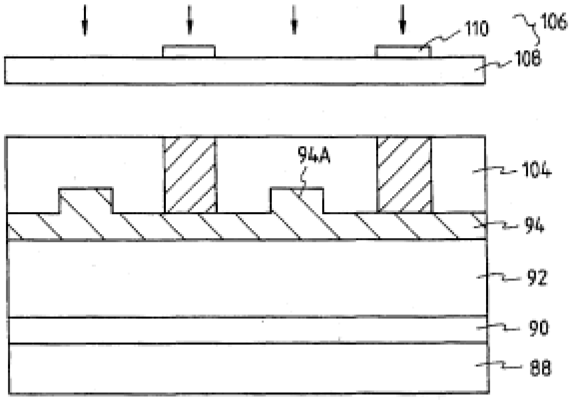
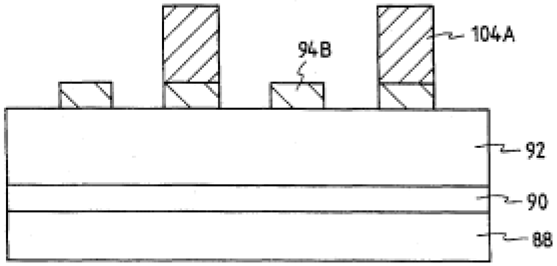
Invalidity Claim Chart Comparing '998 Patent to Bae '625

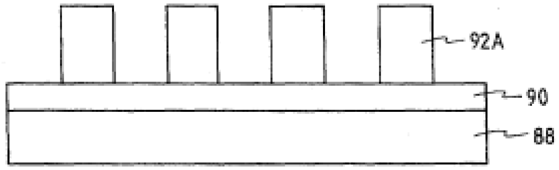
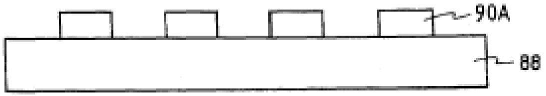
The following asserted claims of STC.UNM’s U.S. Pat. No. 6,042,998 are invalidated pursuant to 35 U.S.C. § 102 and/or § 103, alone or in combination with other references, by the prior art reference U.S. Pat. No. 5,741,625 to Bae et al., entitled “Process for Forming Fine Patterns in a Semiconductor Device Utilizing Multiple Photosensitive Film Patterns and Organic Metal-Coupled Material,” filed June 6, 1996 and issued Apr. 21, 1998 (“Bae '625”). These preliminary invalidity contentions are based on information currently known to Intel, and, as a result, apply interpretations apparently or potentially adopted by STC.UNM. Intel reserves the right to amend its preliminary invalidity contentions in light of developments in the case such as production of discovery, identification of additional prior art, and issuance of an order following any Claim Construction Hearing, as stated in the Scheduling Order (Dkt. 47, dated March 2, 2011).

EXHIBIT D

Asserted Claims of '998 Patent	Bae '625
6. A method for obtaining a pattern wherein the Fourier transform of said pattern contains high spatial frequencies by combining nonlinear functions of intensity of at least two exposures combined with at least one nonlinear processing step intermediate between the two exposures to form three dimensional patterns comprising the steps of:	*See, e.g.*, Abstract: “There are disclosed processes for forming fine patterns on a semiconductor substrate to a lesser degree than the resolving power of a step and repeat used, thereby improving the degree of integration of the semiconductor device. The process comprises the steps of: forming a first light-exposure mask and a second light-exposure mask with interlaced patterns selected from a plurality of fine patterns to be formed on a semiconductor substrate; coating an organic material layer on the semiconductor substrate; patterning the organic material layer by use of the first light-exposure mask, to form organic material layer patterns; forming a photosensitive film over the organic material layer patterns; and patterning the photosensitive film by use of the second light-exposure mask to form photosensitive film patterns, in such a way that each of photosensitive film patterns is interposed between two adjacent organic material layer patterns.” *See, e.g.*, figs.6A-6F:

Asserted Claims of '998 Patent	**Bae '625**
	 Fig . 6A  Fig . 6B

Asserted Claims of '998 Patent	Bae '625
	 Fig. 6C  Fig. 6D

Asserted Claims of '998 Patent	Bae '625
	 Fig. 6E  Fig. 6F *See, e.g.,* C8:54 to C10:11: “Turning now to FIGS. 6A through 6F, there is illustrated a step process for forming fine patterns on a semiconductor device, according to a fourth embodiment of the present invention. First, a beam of light is irradiated, as indicated by arrows, through a first light-exposure mask 98 into a semiconductor device comprising a semiconductor substrate 88 on which a polysilicon layer 90, a first photosensitive film 92, an intermediate layer 94 and a second photosensitive film 96 are sequentially formed. As a result, the second photosensitive film 96 is selectively exposed to the light and thus divided into non-exposed areas and exposed areas. While the intermediate film 94 is prepared by coating SOG on the first photosensitive film 92, the first and the second photosensitive films 92, 96 are formed by coating a positive photosensitive solution on the polysilicon layer 90 and the intermediate layer 94 in a spin-coat and spray manner. The SOG layer 94 consists of glass materials, such as phospho silicate glass, boro phospho silicate glass, and undoped silicate glass. With regard to the first light-exposure mask 98, it comprises a quartz substrate 100 transmissive to light on which first photointerceptive film patterns 102 are formed of chrome. In accordance with the present invention, the first photointerceptive film patterns 102 are twice as sparse as object photosensitive film patterns to be formed. For example, if the object photosensitive

Asserted Claims of '998 Patent	Bae '625
	film patterns have 0.4 .mu.m of unit pitch consisting of 0.2 .mu.m of the width of a pattern and 0.2 .mu.m of the distance between two adjacent patterns, the first photointerceptive film patterns 102 have 0.8 .mu.m of unit pitch consisting of the same width of the pattern and 0.6 .mu.m of the distance between two adjacent patterns. The exposed areas of the second photosensitive film 96 are taken off, to form second photosensitive film patterns 96A through which the SOG layer 94 is selectively exposed, as shown in FIG. 6B. Then, a reactive ion etching process is carried out to remove the SOG layer 94 exposed selectively by the second photosensitive film patterns 96A, at half of its total thickness, so as to form first SOG layer patterns 94A. Each of the first SOG layer patterns 94A is positioned between the residual SOG layers 94 and the second photosensitive film patterns 96A. Thereafter, the second photosensitive film patterns 96A atop the first SOG layer patterns 94A are eliminated, and over the resulting structure, there is newly formed a third photosensitive film 104, as shown in FIG. 6C. A beam of light is irradiated, as indicated by arrow, through a second light-exposure mask 106 into the third photosensitive film 104 which thus is divided into exposed areas and non-exposed areas. With regard to the second light-exposure mask 160, it is comprised of a quartz substrate 108 and second photointerceptive film patterns 110 atop the quartz substrate 108. The second photointerceptive film patterns 110 in the second light-exposure mask 106 are alternated with the first photointerceptive film patterns 102 in the first light-exposure mask so as not to overlap the formed with the latter. That is, the second photointerceptive film patterns 110 with, for example, 0.8 .mu.m of unit pitch consisting of 0.2 .mu.m of pattern width and 0.6 .mu.m of the distance betweeen two adjacent patterns, and the first photointerceptive film patterns 102 having the same dimensions are positioned alternatively. As shown in FIG. 6D, the exposed areas of the third photosensitive film 104 are removed to form third photosensitive film patterns 104A which bare the first SOG layer patterns 94A completely and expose the residual SOG layer partially therethrough, and then, the first SOG layer patterns 94A and the residual SOG layer 94 are subjected to anisotropic etch in a reactive ion etching manner, so as to form second SOG layer patterns 94B. That is, the second SOG layer patterns 94B are formed of the lower portions of the first SOG layer patterns 94A and of the residual SOG layer 94 underneath the third photosensitive film patterns 104A therethrough. These second SOG layer patterns 94B are fine patterns with, for example, 0.4 .mu.m of unit pitch consisting of 0.2 .mu.m of pattern width and 0.2 .mu.m of distance between two adjacent patterns. Subsequently, the third photosensitive film patterns 104A are taken off and the first photosensitive film exposed selectively through the second SOG layer patterns 92A is also removed, to form first photosensitive film patterns 92A through which the polysilicon layer 90 is selectively exposed, as

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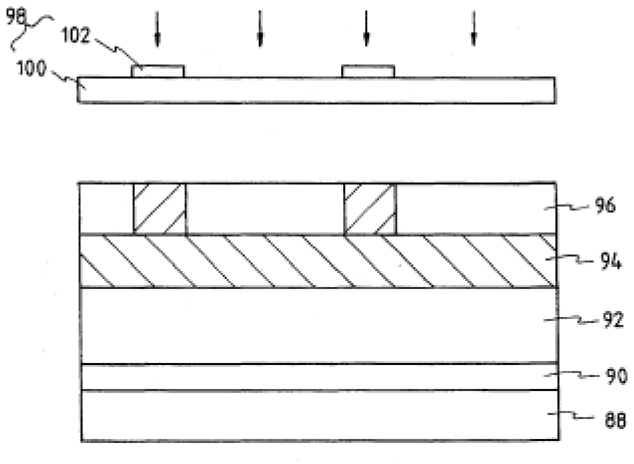
	shown in FIG. 6E. After completion of the formation of the first photosensitive film patterns 92A, the second SOG layer patterns 94B are eliminated. Finally, the polysilicon layer 90 is removed with the first photosensitive film patterns 92A serving as a mask, to form fine polysilicon layer patterns 90A, followed by removal of the first photosensitive film patterns 92A, as shown in FIG. 6F." The phrase "the Fourier transform of said pattern contains high spatial frequencies" is an inherent result of the nonlinear processing step. Also, Admitted Prior Art in the '998 patent itself, Brueck '835, Waldo '094, Ziger, Gwozdz, and Elliott[1] each discloses nonlinear processing, e.g., as explained in "Invalidity Claim Chart Comparing '998 Patent to AAPA, Brueck '835, Waldo '094, Ziger, Gwozdz, and Elliott," served concurrently herewith.
coating a substrate with a first mask material and a first photoresist layer; exposing said first photoresist layer with a first exposure developing said photoresist to form a first pattern in said first photoresist layer, said first pattern containing spatial frequencies greater than those in a two dimensional optical intensity image imposed onto said photoresist layer in said first exposure as a result of a nonlinear response of said first photoresist layer;	*See, e.g.*, figs.6A-6B:  Fig . 6A

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[1] U.S. Patent No. 5,415,835 to Brueck et al. ("Brueck '835"), U.S. Patent No. 4,891,094 to Waldo III ("Waldo '094"), David H. Ziger, et al., *Generalized Approach Toward Modeling Resist Performance*, AlChE Journal, Vol. 37, No. 12, Dec. 1991, at 1863-74 ("Ziger"), Peter S. Gwozdz, *Positive Versus Negative: A Photoresist Analysis*, Semiconductor Lithography VI, SPIE Vol. 275, 1981 ("Gwozdz"), and/or David J. Elliott, Integrated Circuit Fabrication Technology, 2d ed., 1989, at 85-106 and 326 ("Elliott").

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	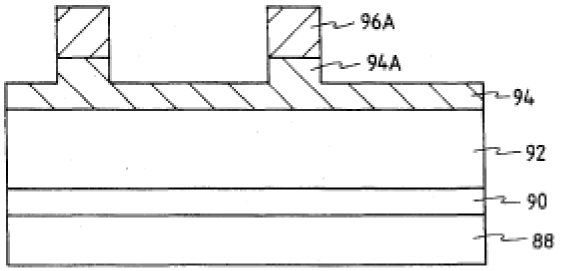 Fig . 6B *See, e.g.*, C8:58 to C9:6: “First, a beam of light is irradiated, as indicated by arrows, through a first light-exposure mask 98 into a semiconductor device comprising a semiconductor substrate 88 on which a polysilicon layer 90, a first photosensitive film 92, an intermediate layer 94 and a second photosensitive film 96 are sequentially formed. As a result, the second photosensitive film 96 is selectively exposed to the light and thus divided into non-exposed areas and exposed areas. While the intermediate film 94 is prepared by coating SOG on the first photosensitive film 92, the first and the second photosensitive films 92, 96 are formed by coating a positive photosensitive solution on the polysilicon layer 90 and the intermediate layer 94 in a spin-coat and spray manner. The SOG layer 94 consists of glass materials, such as phospho silicate glass, boro phospho silicate glass, and undoped silicate glass.” *See, e.g.*, C9:20-23: “The exposed areas of the second photosensitive film 96 are taken off, to form second photosensitive film patterns 96A through which the SOG layer 94 is selectively exposed, as shown in FIG. 6B.” The phrase “containing spatial frequencies greater than those in a two dimensional optical intensity image imposed onto said photoresist layer . . . as a result of a nonlinear response of said [photoresist layer]” is inherently disclosed in the above-cited disclosure of photoresist. Also, Admitted Prior Art in the '998 patent itself, Brueck '835, Waldo '094, Ziger, Gwozdz, and Elliott each discloses the nonlinear response of photoresist, e.g., as explained in “Invalidity Claim Chart Comparing '998 Patent to AAPA, Brueck '835, Waldo '094, Ziger, Gwozdz, and Elliott,” served concurrently herewith.

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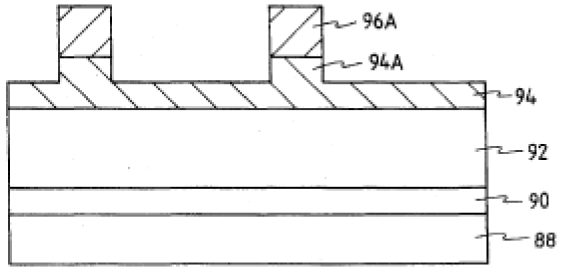
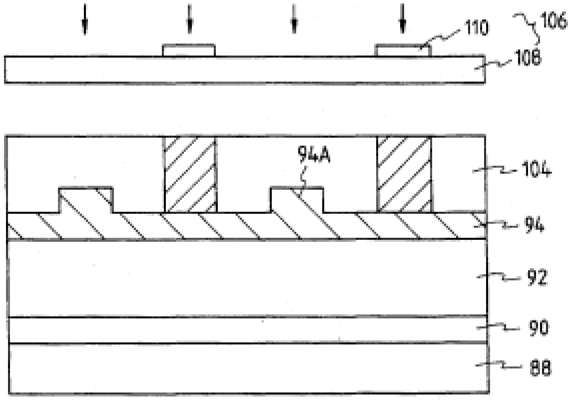
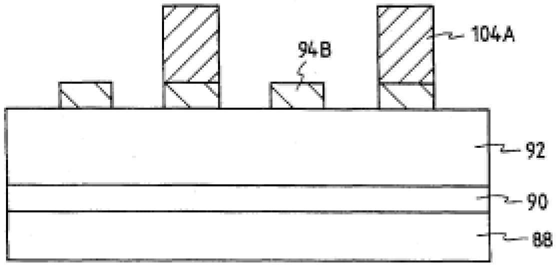
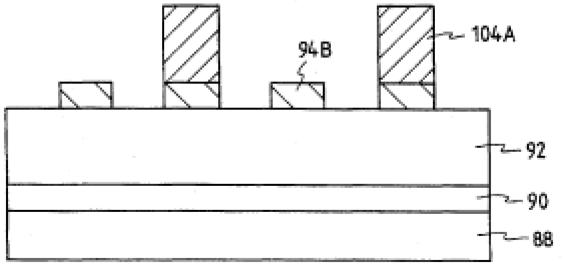
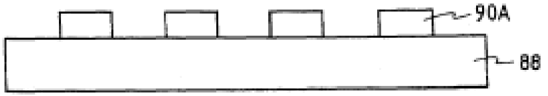
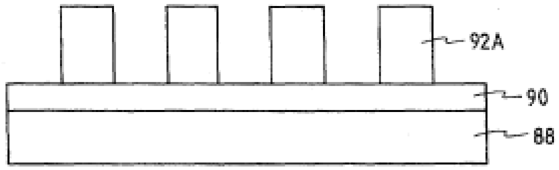
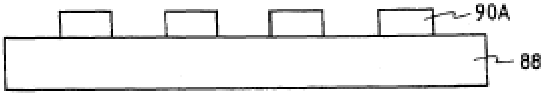
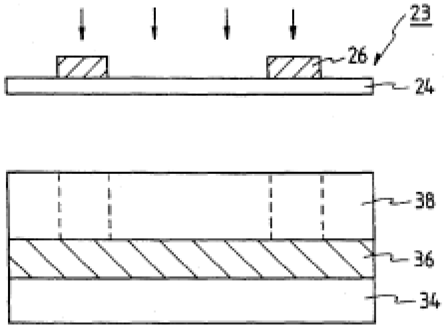
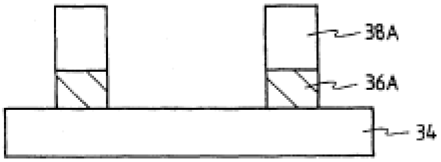
transferring said first pattern into said first mask material, said first mask material comprising at least one of SiO.sub.2, Si.sub.3 N.sub.4, a metal, a polysilicon and a polymer;	*See*, *e.g.*, fig.6B:  Fig . 6 B *See*, *e.g.*, C9:23-26: "Then, a reactive ion etching process is carried out to remove the SOG layer 94 exposed selectively by the second photosensitive film patterns 96A, at half of its total thickness, so as to form first SOG layer patterns 94A."
coating said substrate with a second photoresist; exposing said second photoresist with a second exposure developing said second photoresist layer to form a second pattern in said second photoresist layer, said second pattern containing spatial frequencies greater than those in a two dimensional optical intensity image imposed onto said photoresist layer in said second exposure as a result of a nonlinear response of said second photoresist layer;	*See*, *e.g.*, figs.6C-6D:

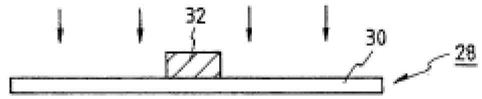
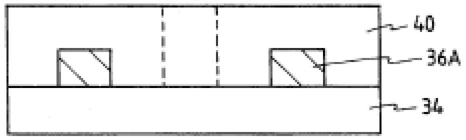
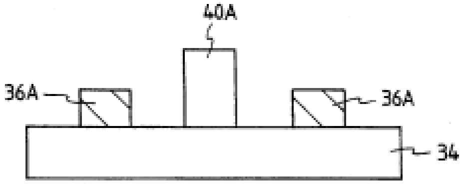
Asserted Claims of '998 Patent	Bae '625
	 Fig . 6C  Fig . 6D *See, e.g.*, C9:30-58: "Thereafter, the second photosensitive film patterns 96A atop the first SOG layer patterns 94A are eliminated, and over the resulting structure, there is newly formed a third photosensitive film 104, as shown in FIG. 6C. A beam of light is irradiated, as indicated by arrow, through a second light-exposure mask 106 into the third photosensitive film 104 which thus is divided into exposed areas and non-exposed areas. With regard to the second light-exposure mask 160, it is comprised of a quartz substrate 108 and

Asserted Claims of '998 Patent	Bae '625
	second photointerceptive film patterns 110 atop the quartz substrate 108. The second photointerceptive film patterns 110 in the second light-exposure mask 106 are alternated with the first photointerceptive film patterns 102 in the first light-exposure mask so as not to overlap the formed with the latter. That is, the second photointerceptive film patterns 110 with, for example, 0.8 .mu.m of unit pitch consisting of 0.2 .mu.m of pattern width and 0.6 .mu.m of the distance betweeen two adjacent patterns, and the first photointerceptive film patterns 102 having the same dimensions are positioned alternatively. As shown in FIG. 6D, the exposed areas of the third photosensitive film 104 are removed to form third photosensitive film patterns 104A which bare the first SOG layer patterns 94A completely and expose the residual SOG layer partially therethrough, and then, the first SOG layer patterns 94A and the residual SOG layer 94 are subjected to anisotropic etch in a reactive ion etching manner, so as to form second SOG layer patterns 94B." The phrase "containing spatial frequencies greater than those in a two dimensional optical intensity image imposed onto said photoresist layer . . . as a result of a nonlinear response of said [photoresist layer]" is inherently disclosed in the above-cited disclosure of photoresist. Also, Admitted Prior Art in the '998 patent itself, Brueck '835, Waldo '094, Ziger, Gwozdz, and Elliott each discloses the nonlinear response of photoresist, e.g., as explained in "Invalidity Claim Chart Comparing '998 Patent to AAPA, Brueck '835, Waldo '094, Ziger, Gwozdz, and Elliott," served concurrently herewith.
transferring said first pattern and said second pattern into said substrate using a combined mask including parts of said first mask layer and said second photoresist;	*See, e.g.,* figs.6D-6F:  Fig . 6D

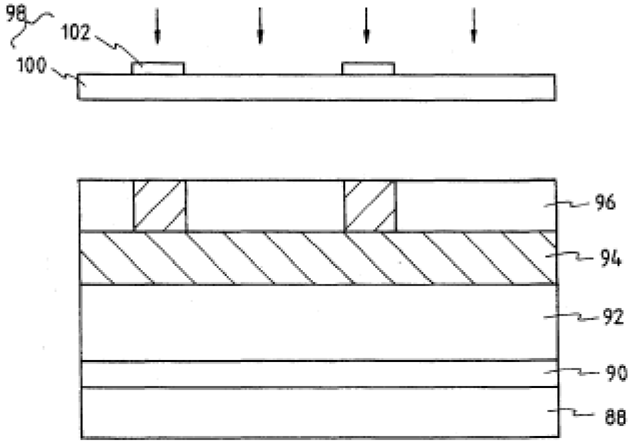
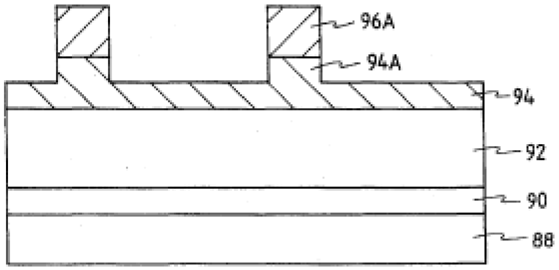
Asserted Claims of '998 Patent	**Bae '625**
	 Fig. 6E  Fig. 6F *See, e.g.,* C9:50 to C10:11: "As shown in FIG. 6D, the exposed areas of the third photosensitive film 104 are removed to form third photosensitive film patterns 104A which bare the first SOG layer patterns 94A completely and expose the residual SOG layer partially therethrough, and then, the first SOG layer patterns 94A and the residual SOG layer 94 are subjected to anisotropic etch in a reactive ion etching manner, so as to form second SOG layer patterns 94B. That is, the second SOG layer patterns 94B are formed of the lower portions of the first SOG layer patterns 94A and of the residual SOG layer 94 underneath the third photosensitive film patterns 104A therethrough. These second SOG layer patterns 94B are fine patterns with, for example, 0.4 .mu.m of unit pitch consisting of 0.2 .mu.m of pattern width and 0.2 .mu.m of distance between two adjacent patterns. Subsequently, the third photosensitive film patterns 104A are taken off and the first photosensitive film exposed selectively through the second SOG layer patterns 92A is also removed, to form first photosensitive film patterns 92A through which the polysilicon layer 90 is selectively exposed, as shown in FIG. 6E. After completion of the formation of the first photosensitive film patterns 92A, the second SOG layer patterns 94B are eliminated. Finally, the polysilicon layer 90 is removed with the first photosensitive film patterns 92A serving as a mask, to form fine polysilicon layer patterns 90A, followed by removal of the first photosensitive film patterns 92A, as shown in FIG. 6F."

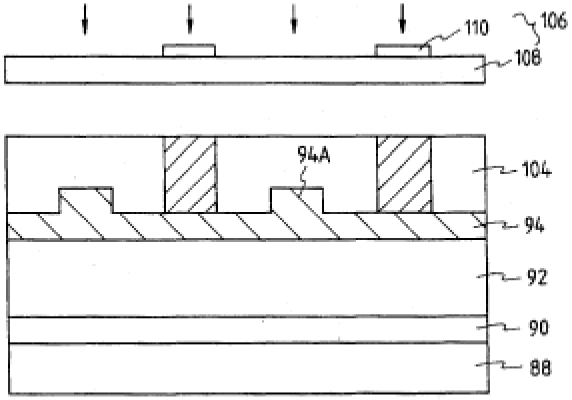
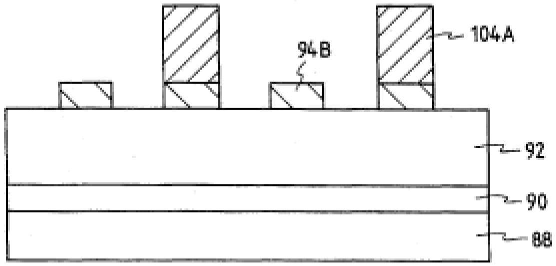
Asserted Claims of '998 Patent	Bae '625
removing said first mask material and said second photoresist.	*See, e.g.*, figs.6E-6F:  Fig . 6E  Fig . 6F *See, e.g.*, C9:66 to C10:11: "Subsequently, the third photosensitive film patterns 104A are taken off and the first photosensitive film exposed selectively through the second SOG layer patterns 92A is also removed, to form first photosensitive film patterns 92A through which the polysilicon layer 90 is selectively exposed, as shown in FIG. 6E. After completion of the formation of the first photosensitive film patterns 92A, the second SOG layer patterns 94B are eliminated. Finally, the polysilicon layer 90 is removed with the first photosensitive film patterns 92A serving as a mask, to form fine polysilicon layer patterns 90A, followed by removal of the first photosensitive film patterns 92A, as shown in FIG. 6F."
7. The method of claim 6 wherein said transferring step includes at least one of etching, deposition and-lift off, and damascene.	*See, e.g.*, C9:23-26: "Then, a reactive ion etching process is carried out to remove the SOG layer 94 exposed selectively by the second photosensitive film patterns 96A, at half of its total thickness, so as to form first SOG layer patterns 94A." *See, e.g.*, C9:50-58:

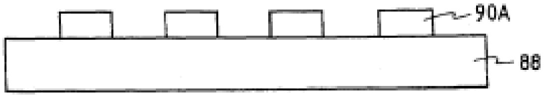
Asserted Claims of '998 Patent	Bae '625
	"As shown in FIG. 6D, the exposed areas of the third photosensitive film 104 are removed to form third photosensitive film patterns 104A which bare the first SOG layer patterns 94A completely and expose the residual SOG layer partially therethrough, and then, the first SOG layer patterns 94A and the residual SOG layer 94 are subjected to anisotropic etch in a reactive ion etching manner, so as to form second SOG layer patterns 94B."
8. A method for increasing spatial frequency content of lithographic patterns comprising the steps of:	*See, e.g.*, figs.3C-3F:  Fig . 3C  Fig . 3D

Asserted Claims of '998 Patent	**Bae '625**
	  Fig . 3E  Fig . 3F *See, e.g.*, C5:26 to C6:5: "With reference to FIGS. 3C through 3F, there is illustrated a process for forming fine patterns of a semiconductor device, according to a first embodiment on a the present invention. First, as shown in FIG. 3C, a light is irradiated, as indicated by arrows, through the first light-exposure mask 23 of FIG. 3A into a semiconductor device comprising a lower layer 34 on which an organic material layer 36 and a first photosensitive film 38 are sequentially formed. The lower layer 34 is atop a semiconductor substrate (not shown). As a result, the first photosensitive film 38 is selectively exposed to the beam. In the meantime, the organic material layer 36 serves as a reflection-protective layer. Thereafter, the light-exposed areas of the first photosensitive film 38 are removed, to form first photosensitive film patterns 38A through which the organic material layer 36 is partially exposed,

Asserted Claims of '998 Patent	Bae '625
	as shown in FIG. 3D. Then, an etching step is undertaken to take off the organic material layer 36 exposed partially through the first photosensitive film patterns 38A, to form organic material layer patterns 36A which, in turn, expose the lower layer 34 selectively therethrough. Following formation of the organic material layer patterns 36A, the first photosensitive film patterns 38A are eliminated, and a second photosensitive film 40 is coated entirely over the resulting structure, as shown in FIG. 3E. The second photosensitive film 40 is exposed to a beam of light irradiated as indicated by arrows. At this time, the second light-exposure mask 28 of FIG. 3B causes the second photosensitive film 40 to be exposed selectively. Finally, for formation of a second photosensitive film pattern 40A, all areas of the second photosensitive film but the masked one are removed so as to bare the organic material layer pattern 40A completely, as shown in FIG. 3F. As mentioned above, the second photointerceptive film pattern 32 is positioned at the central portion between the first photointerceptive film patterns 26 so as not to overlap the first photointerceptive film patterns 26 with the second photointerceptive film pattern 32. Based on this position structure, the second photosensitive film pattern 40A is interposed between the organic material layer patterns 36A. All of the second photosensitive film patterns 40A and the organic material layer pattern 36A play a role of a mask for the fine pattern which exposes the lower layer 34 selectively therethrough." *See, e.g.*, figs.6A-6F:

Asserted Claims of '998 Patent	Bae '625
	 Fig . 6A  Fig . 6B

Asserted Claims of '998 Patent	**Bae '625**
	 Fig . 6C  Fig . 6D

Asserted Claims of '998 Patent	Bae '625
	 Fig . 6E  Fig . 6F *See, e.g.*, C8:54 to C10:11: "Turning now to FIGS. 6A through 6F, there is illustrated a step process for forming fine patterns on a semiconductor device, according to a fourth embodiment of the present invention. First, a beam of light is irradiated, as indicated by arrows, through a first light-exposure mask 98 into a semiconductor device comprising a semiconductor substrate 88 on which a polysilicon layer 90, a first photosensitive film 92, an intermediate layer 94 and a second photosensitive film 96 are sequentially formed. As a result, the second photosensitive film 96 is selectively exposed to the light and thus divided into non-exposed areas and exposed areas. While the intermediate film 94 is prepared by coating SOG on the first photosensitive film 92, the first and the second photosensitive films 92, 96 are formed by coating a positive photosensitive solution on the polysilicon layer 90 and the intermediate layer 94 in a spin-coat and spray manner. The SOG layer 94 consists of glass materials, such as phospho silicate glass, boro phospho silicate glass, and undoped silicate glass. With regard to the first light-exposure mask 98, it comprises a quartz substrate 100 transmissive to light on which first photointerceptive film patterns 102 are formed of chrome. In accordance with the present invention, the first photointerceptive film patterns 102 are twice as sparse as object photosensitive film patterns to be formed. For example, if the object photosensitive film patterns have 0.4 .mu.m of unit pitch consisting of 0.2 .mu.m of the width of a pattern and 0.2 .mu.m of the distance between two adjacent patterns, the first photointerceptive film patterns 102

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	have 0.8 .mu.m of unit pitch consisting of the same width of the pattern and 0.6 .mu.m of the distance between two adjacent patterns. The exposed areas of the second photosensitive film 96 are taken off, to form second photosensitive film patterns 96A through which the SOG layer 94 is selectively exposed, as shown in FIG. 6B. Then, a reactive ion etching process is carried out to remove the SOG layer 94 exposed selectively by the second photosensitive film patterns 96A, at half of its total thickness, so as to form first SOG layer patterns 94A. Each of the first SOG layer patterns 94A is positioned between the residual SOG layers 94 and the second photosensitive film patterns 96A. Thereafter, the second photosensitive film patterns 96A atop the first SOG layer patterns 94A are eliminated, and over the resulting structure, there is newly formed a third photosensitive film 104, as shown in FIG. 6C. A beam of light is irradiated, as indicated by arrow, through a second light-exposure mask 106 into the third photosensitive film 104 which thus is divided into exposed areas and non-exposed areas. With regard to the second light-exposure mask 160, it is comprised of a quartz substrate 108 and second photointerceptive film patterns 110 atop the quartz substrate 108. The second photointerceptive film patterns 110 in the second light-exposure mask 106 are alternated with the first photointerceptive film patterns 102 in the first light-exposure mask so as not to overlap the formed with the latter. That is, the second photointerceptive film patterns 110 with, for example, 0.8 .mu.m of unit pitch consisting of 0.2 .mu.m of pattern width and 0.6 .mu.m of the distance betweeen two adjacent patterns, and the first photointerceptive film patterns 102 having the same dimensions are positioned alternatively. As shown in FIG. 6D, the exposed areas of the third photosensitive film 104 are removed to form third photosensitive film patterns 104A which bare the first SOG layer patterns 94A completely and expose the residual SOG layer partially therethrough, and then, the first SOG layer patterns 94A and the residual SOG layer 94 are subjected to anisotropic etch in a reactive ion etching manner, so as to form second SOG layer patterns 94B. That is, the second SOG layer patterns 94B are formed of the lower portions of the first SOG layer patterns 94A and of the residual SOG layer 94 underneath the third photosensitive film patterns 104A therethrough. These second SOG layer patterns 94B are fine patterns with, for example, 0.4 .mu.m of unit pitch consisting of 0.2 .mu.m of pattern width and 0.2 .mu.m of distance between two adjacent patterns. Subsequently, the third photosensitive film patterns 104A are taken off and the first photosensitive film exposed selectively through the second SOG layer patterns 92A is also removed, to form first photosensitive film patterns 92A through which the polysilicon layer 90 is selectively exposed, as shown in FIG. 6E. After completion of the formation of the first photosensitive film patterns 92A,

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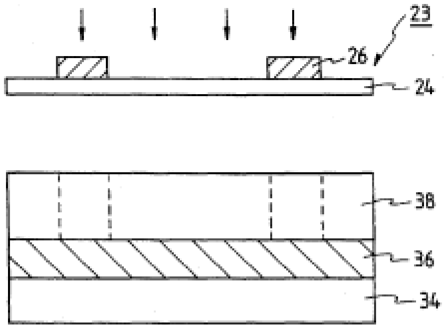
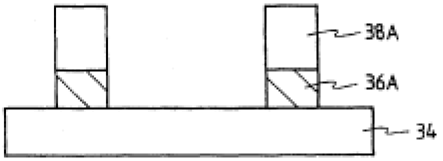
	the second SOG layer patterns 94B are eliminated. Finally, the polysilicon layer 90 is removed with the first photosensitive film patterns 92A serving as a mask, to form fine polysilicon layer patterns 90A, followed by removal of the first photosensitive film patterns 92A, as shown in FIG. 6F.”
depositing a material; depositing a photoresist on said material; exposing a periodic image in said photoresist, said periodic image having a pitch p.sub.min and a linewidth less than p.sub.min /2; developing said periodic image to form a periodic pattern in said photoresist;	*See, e.g.*, figs.3C-3D:  Fig . 3C  Fig . 3D *See, e.g.*, C5:30-44: “First, as shown in FIG. 3C, a light is irradiated, as indicated by arrows, through the first light-exposure mask 23 of FIG. 3A into a semiconductor device comprising a lower layer 34 on which an organic material layer 36 and a first photosensitive film 38 are sequentially formed. The lower layer 34 is atop a semiconductor substrate (not shown). As a result, the first photosensitive film 38 is selectively exposed to the beam. In the meantime, the organic material layer 36 serves as a

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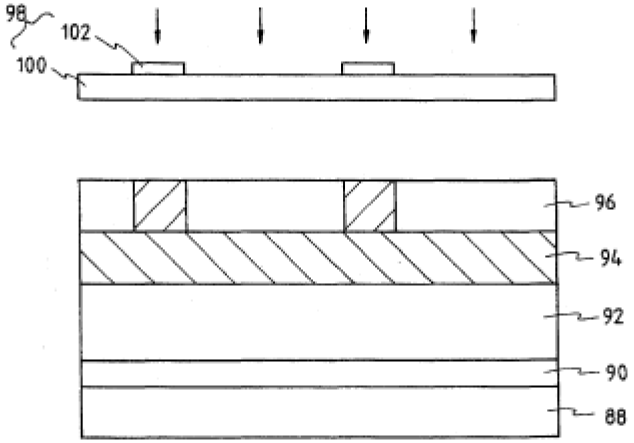
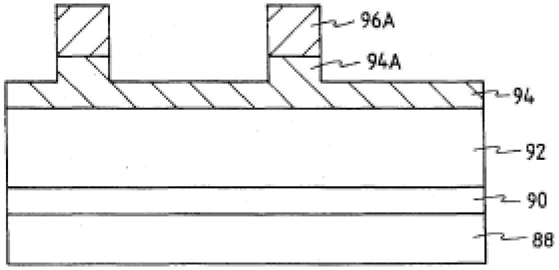
	reflection-protective layer. Thereafter, the light-exposed areas of the first photosensitive film 38 are removed, to form first photosensitive film patterns 38A through which the organic material layer 36 is partially exposed, as shown in FIG. 3D.” *See, e.g.*, figs.6A-6B:  Fig . 6A  Fig . 6B

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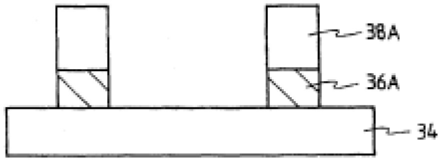
	See, e.g., C8:58 to C9:23: "First, a beam of light is irradiated, as indicated by arrows, through a first light-exposure mask 98 into a semiconductor device comprising a semiconductor substrate 88 on which a polysilicon layer 90, a first photosensitive film 92, an intermediate layer 94 and a second photosensitive film 96 are sequentially formed. As a result, the second photosensitive film 96 is selectively exposed to the light and thus divided into non-exposed areas and exposed areas. While the intermediate film 94 is prepared by coating SOG on the first photosensitive film 92, the first and the second photosensitive films 92, 96 are formed by coating a positive photosensitive solution on the polysilicon layer 90 and the intermediate layer 94 in a spin-coat and spray manner. The SOG layer 94 consists of glass materials, such as phospho silicate glass, boro phospho silicate glass, and undoped silicate glass. With regard to the first light-exposure mask 98, it comprises a quartz substrate 100 transmissive to light on which first photointerceptive film patterns 102 are formed of chrome. In accordance with the present invention, the first photointerceptive film patterns 102 are twice as sparse as object photosensitive film patterns to be formed. For example, if the object photosensitive film patterns have 0.4 .mu.m of unit pitch consisting of 0.2 .mu.m of the width of a pattern and 0.2 .mu.m of the distance between two adjacent patterns, the first photointerceptive film patterns 102 have 0.8 .mu.m of unit pitch consisting of the same width of the pattern and 0.6 .mu.m of the distance between two adjacent patterns. The exposed areas of the second photosensitive film 96 are taken off, to form second photosensitive film patterns 96A through which the SOG layer 94 is selectively exposed, as shown in FIG. 6B."
transferring said periodic pattern to said material;	*See, e.g.*, fig.3D:  Fig.3D *See, e.g.*, C5:44-49:

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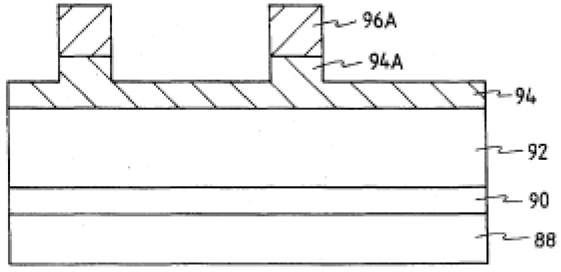
	"Then, an etching step is undertaken to take off the organic material layer 36 exposed partially through the first photosensitive film patterns 38A, to form organic material layer patterns 36A which, in turn, expose the lower layer 34 selectively therethrough." *See, e.g.*, fig.6B:  Fig . 6B *See, e.g.*, C9:23-26: "Then, a reactive ion etching process is carried out to remove the SOG layer 94 exposed selectively by the second photosensitive film patterns 96A, at half of its total thickness, so as to form first SOG layer patterns 94A."
depositing a second photoresist layer on said material; offsetting said periodic pattern by p.sub.min /2; repeating said exposing, developing and transferring steps, thereby interpolating new said pattern midway between said pattern.	*See, e.g.*, figs.3E-3F:

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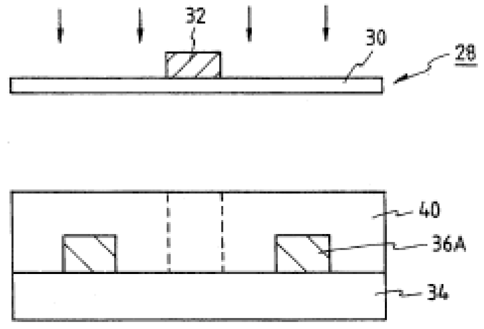
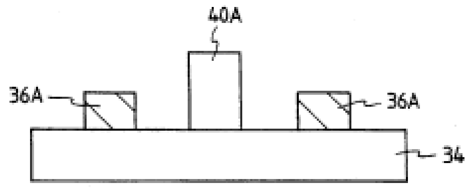
	 Fig . 3E  Fig . 3F *See, e.g.*, C5:50 to C6:5: “Following formation of the organic material layer patterns 36A, the first photosensitive film patterns 38A are eliminated, and a second photosensitive film 40 is coated entirely over the resulting structure, as shown in FIG. 3E. The second photosensitive film 40 is exposed to a beam of light irradiated as indicated by arrows. At this time, the second light-exposure mask 28 of FIG. 3B causes the second photosensitive film 40 to be exposed selectively. Finally, for formation of a second photosensitive film pattern 40A, all areas of the second photosensitive film but the masked one are removed so as to bare the organic material layer pattern 40A completely, as shown in FIG. 3F. As mentioned above, the second photointerceptive film pattern 32 is positioned at the central portion between the first photointerceptive film patterns 26 so as not to overlap the first photointerceptive film patterns 26 with the second photointerceptive film pattern 32. Based on this position structure, the second photosensitive film pattern 40A is

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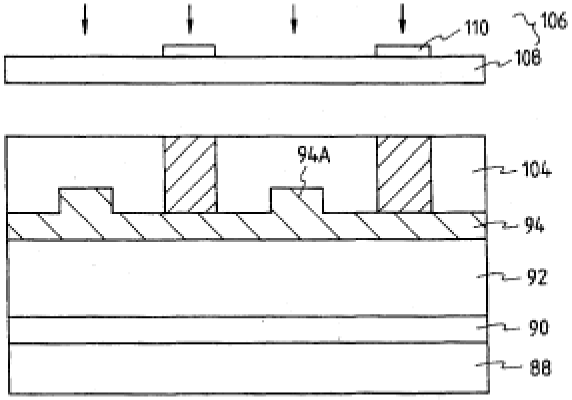
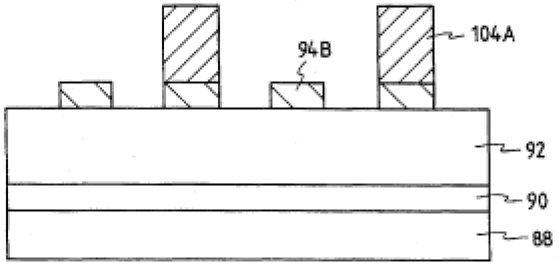
	interposed between the organic material layer patterns 36A. All of the second photosensitive film patterns 40A and the organic material layer pattern 36A play a role of a mask for the fine pattern which exposes the lower layer 34 selectively therethrough.” *See, e.g.*, figs.6C-6F:  Fig . 6C  Fig . 6D

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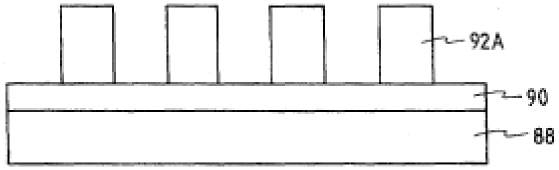
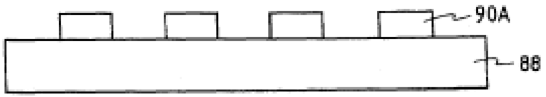
	 Fig. 6E  Fig. 6F *See, e.g.,* C9:30 to C10:11: “Thereafter, the second photosensitive film patterns 96A atop the first SOG layer patterns 94A are eliminated, and over the resulting structure, there is newly formed a third photosensitive film 104, as shown in FIG. 6C. A beam of light is irradiated, as indicated by arrow, through a second light-exposure mask 106 into the third photosensitive film 104 which thus is divided into exposed areas and non-exposed areas. With regard to the second light-exposure mask 160, it is comprised of a quartz substrate 108 and second photointerceptive film patterns 110 atop the quartz substrate 108. The second photointerceptive film patterns 110 in the second light-exposure mask 106 are alternated with the first photointerceptive film patterns 102 in the first light-exposure mask so as not to overlap the formed with the latter. That is, the second photointerceptive film patterns 110 with, for example, 0.8 .mu.m of unit pitch consisting of 0.2 .mu.m of pattern width and 0.6 .mu.m of the distance betweeen two adjacent patterns, and the first photointerceptive film patterns 102 having the same dimensions are positioned alternatively. As shown in FIG. 6D, the exposed areas of the third photosensitive film 104 are removed to form third photosensitive film patterns 104A which bare the first SOG layer patterns 94A completely and expose the residual SOG layer partially therethrough, and then, the first SOG layer patterns 94A and the residual SOG layer 94 are subjected to anisotropic etch in a reactive ion etching manner, so as to form second SOG layer patterns 94B. That is, the second SOG layer patterns 94B

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	are formed of the lower portions of the first SOG layer patterns 94A and of the residual SOG layer 94 underneath the third photosensitive film patterns 104A therethrough. These second SOG layer patterns 94B are fine patterns with, for example, 0.4 .mu.m of unit pitch consisting of 0.2 .mu.m of pattern width and 0.2 .mu.m of distance between two adjacent patterns. Subsequently, the third photosensitive film patterns 104A are taken off and the first photosensitive film exposed selectively through the second SOG layer patterns 92A is also removed, to form first photosensitive film patterns 92A through which the polysilicon layer 90 is selectively exposed, as shown in FIG. 6E. After completion of the formation of the first photosensitive film patterns 92A, the second SOG layer patterns 94B are eliminated. Finally, the polysilicon layer 90 is removed with the first photosensitive film patterns 92A serving as a mask, to form fine polysilicon layer patterns 90A, followed by removal of the first photosensitive film patterns 92A, as shown in FIG. 6F.”
9. The method of claim 8, wherein said step of depositing a material includes depositing doped polysilicon.	*See, e.g.*, C8:58-63: “First, a beam of light is irradiated, as indicated by arrows, through a first light-exposure mask 98 into a semiconductor device comprising a semiconductor substrate 88 on which a polysilicon layer 90, a first photosensitive film 92, an intermediate layer 94 and a second photosensitive film 96 are sequentially formed.”
10. The method of claim 8, wherein said material includes an SiO.sub.2 overlayer configured to act as a hardmask during said etching step.	*See, e.g.*, C8:65 to C9:6: “While the intermediate film 94 is prepared by coating SOG on the first photosensitive film 92, the first and the second photosensitive films 92, 96 are formed by coating a positive photosensitive solution on the polysilicon layer 90 and the intermediate layer 94 in a spin-coat and spray manner. The SOG layer 94 consists of glass materials, such as phospho silicate glass, boro phospho silicate glass, and undoped silicate glass.”
11. The method of claim 8, wherein said step of depositing a photoresist includes depositing at least one of a negative photoresist, a positive photoresist and a positive photoresist with an image reversal step.	*See, e.g.*, C10:12-17: “Though a positive photosensitive film is exemplified in the fourth embodiment of the present invention, properly controlled positive/negative photosensitive solutions for the first and the second photosensitive films along with light-exposure masks appropriate for these solutions may also be useful to form fine patterns.”
16. The method of claim 8, wherein said step of developing said periodic pattern includes etching said	*See, e.g.*, C2:44-56:

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pattern into a hardmask.	"In order to overstep the limit of the fine pattern formed by the process of FIG. 1, there has been suggested a multilayer photosensitive film process in which a plurality of light-exposure steps are executed repeatedly. That is, a phase-reverse masking process in which the phase of a beam is reversed, is used to reduce an exposure effect caused by interference of another beam of light passing through an adjacent pattern, and a top surface imaging (hereinafter referred to as "TSI") process which comprises a plasma etching step wherein a relatively hard top layer coupled with an organic metal material is formed partially over the surface of photosensitive film, is utilized to form photosensitive film patterns." *See*, *e.g.*, C3:22-42: "Then, the photosensitive film 14 is contacted with an organic metal material gas containing silicon and permeated therewith, to form a silylation layer 22 consisting of silicon. At the moment, the silylation layer formed on the light-exposed area of the photosensitive film 14 is thicker than that formed on the non-exposed area of the photosensitive film 14 due to differences in diffusion rate and reaction rate with silicon between the exposed area and the non-exposed area. In addition, in the silylation layer 22 formed on the exposed area of the photosensitive film 14, a central portion is thicker than any other portion, and as the distance from the central portion is farther, the thickness of the silylation layer is thinner. Further, the silylation layer 22 has a hard structure more resistant to plasma than that of the photosensitive film 14. Subsequently, the areas of the photosensitive film 14 without silicon ale removed by means of oxygen plasm to a degree that the object material layer of etch 12 is selectively exposed with the silylation layer 22 serving as a mask. Thus, photosensitive film patterns are formed."
18. The method of claim 8, wherein said step of depositing a material includes depositing a material on at least one of a textured substrate, a quantum structure, a flux pinning site for high-T.sub.c superconductors, a birefringent material, a reflective optical coating, a photonic bandgap, an electronic device, an optical storage media, a magnetic storage media, an array of field emitters and a Dynamic Random Access Memory capacitor.	*See*, *e.g.*, C5:30-40: "First, as shown in FIG. 3C, a light is irradiated, as indicated by arrows, through the first light-exposure mask 23 of FIG. 3A into a semiconductor device comprising a lower layer 34 on which an organic material layer 36 and a first photosensitive film 38 are sequentially formed. The lower layer 34 is atop a semiconductor substrate (not shown). As a result, the first photosensitive film 38 is selectively exposed to the beam. In the meantime, the organic material layer 36 serves as a reflection-protective layer."