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[US/US]; 639 Quaker St., Chappaqua, NY 10514 (US).
FORBES, Leonard [US/US]; 965 NW Highland Terrace,
Corvallis, OR 97330 (US).

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(74) Agents: **STEFFEY, Charles, E.** et al.; P.O. Box 2938,
Minneapolis, MN 55402 (US).

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(71) Applicant (for all designated States except US): **MI-
CRON TECHNOLOGY INC.** [US/US]; 8000 South
Federal Way, Boise, ID 83716-9632 (US).

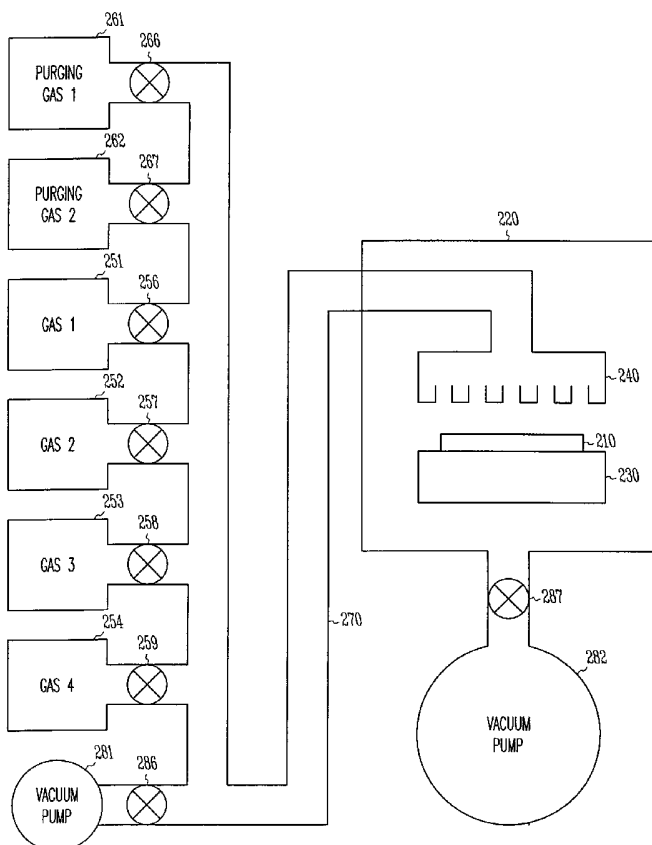
(72) Inventors; and

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(75) Inventors/Applicants (for US only): **AHN, Kie, Y.**

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(54) Title: ATOMIC LAYER DEPOSITED DIELECTRIC LAYERS



(57) Abstract: An atomic layer deposited dielectric layer and a method of fabricating such a dielectric layer produce a reliable dielectric layer having an equivalent oxide thickness thinner than attainable using SiO₂. Depositing a hafnium metal layer on a substrate surface by atomic layer deposition and depositing a hafnium oxide layer on the hafnium metal layer by atomic layer deposition form a hafnium oxide dielectric layer substantially free of silicon oxide. Dielectric layers containing atomic layer deposited hafnium oxide are thermodynamically stable such that the hafnium oxide will have minimal reactions with a silicon substrate or other structures during processing.

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
 EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 518 634 B1 (KAUSHIK VIDYA S ET AL) 11 February 2003 (2003-02-11) column 1, line 13 - line 36 column 2, line 13 - line 48; figures 1,2 column 2, line 57 - column 3, line 3; figure 3 column 3, line 4 - line 14 column 3, line 22 - line 48; claims 1,3,4; figure 4	1-4, 12, 13, 21, 22, 55, 59
Y	----- -/--	5-11, 14-20, 23-54, 56-58, 60-73

Further documents are listed in the continuation of box C. Patent family members are listed in annex.

° Special categories of cited documents:

A document defining the general state of the art which is not considered to be of particular relevance	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
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P document published prior to the international filing date but later than the priority date claimed	

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	YAMAMOTO KAZUHIKO ET AL: "Effect of Hf metal predeposition on the properties of sputtered HfO ₂ /Hf stacked gate dielectrics" APPLIED PHYSICS LETTERS, AMERICAN INSTITUTE OF PHYSICS. NEW YORK, US, vol. 81, no. 11, 9 September 2002 (2002-09-09), pages 2053-2055, XP012031905 ISSN: 0003-6951 page 2053; figure 1 page 2054, left-hand column; figure 2 page 2055	55-62
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A		5,8,9, 15,17, 18,56-58
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International Application No

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X	HOSHINO Y ET AL: "Characterization and control of the HfO ₂ /Hf/Si (001) interfaces" APPLIED PHYSICS LETTERS, AMERICAN INSTITUTE OF PHYSICS. NEW YORK, US, vol. 81, no. 14, 30 September 2002 (2002-09-30), pages 2650-2652, XP012032094 ISSN: 0003-6951 the whole document	55-62
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