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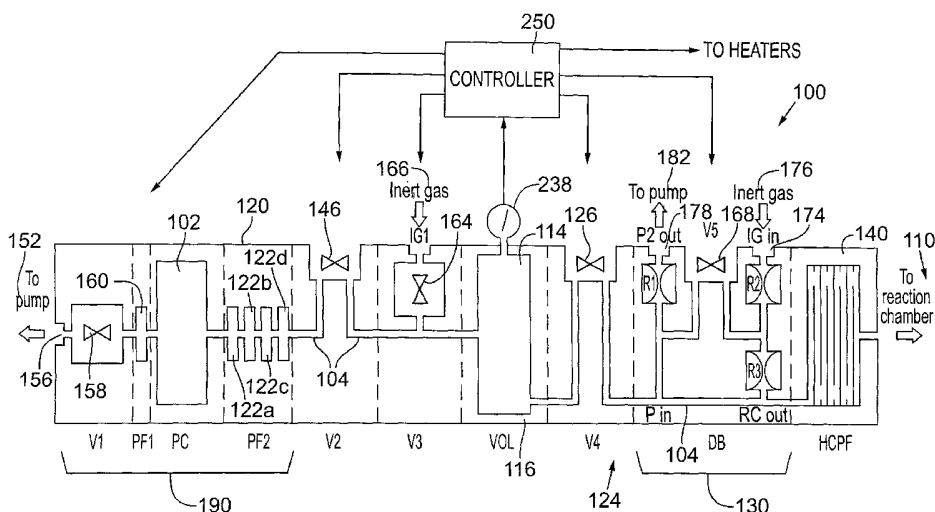
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[Continued on next page]

(54) Title: PRECURSOR MATERIAL DELIVERY SYSTEM FOR ATOMIC LAYER DEPOSITION



(57) Abstract: A precursor delivery system (100) includes a flow path (104) from a precursor container (102) to a reaction space (110) of a thin film deposition system, such as an atomic layer deposition reactor. A staging volume (114) is preferably between precursor container (102) and reaction space (110) for receiving at least one dose of precursor material from precursor container (102), from which a series of pulses is released toward reaction space (110). Precursor material is typically vaporized after loading in precursor container (102), by heating or reducing the pressure inside precursor container (102). A vacuum line (156) preferably coupled to precursor container (102) bypasses reaction space (110) for reducing pressure inside precursor container (102) without drawing particles into reaction space (110). A high conductivity particle filter having inertial traps may be included, preferably between precursor container (102) and a staging volume (114), for filtering particles from the precursor material.

WO 2004/024981 A3



ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,  
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,  
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 03/28436

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 C23C16/44 C23C16/455 C30B25/14

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 C23C C30B B01D

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, WPI Data, PAJ, INSPEC

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2001/054377 A1 (LINDFORS SVEN ET AL) 27 December 2001 (2001-12-27) paragraph [0010] - paragraph [0012] paragraph [0034]; claims; figures -----	1-36,38, 39,42
A	US 2001/042523 A1 (KESALA JANNE) 22 November 2001 (2001-11-22) cited in the application paragraph [0024] - paragraph [0041]; claims; figures -----	1-36,38, 39,42
A	US 6 210 485 B1 (CHANG FRANK ET AL) 3 April 2001 (2001-04-03) column 5, line 13 - column 6, line 20; claims; figure 4 -----	1-36,38, 39,42
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Further documents are listed in the continuation of box C.       Patent family members are listed in annex.

° Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"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.</p> <p>"&amp;" document member of the same patent family</p>
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Date of the actual completion of the international search  <p style="text-align: center;">22 January 2004</p>	Date of mailing of the international search report  <p style="text-align: center;">19 JAN 06 04</p>
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Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer  <p style="text-align: center;">Mauger, J</p>
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# INTERNATIONAL SEARCH REPORT

Intern	Application No
PCT/US 03/28436	

**C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT**

Category <sup>o</sup>	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 01/45158 A (GENUS INC) 21 June 2001 (2001-06-21) page 5, line 10 - line 15; claims; figures 4,5 page 15, line 3 - line 17 -----	1-36,38, 39,42

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 03/28436

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3.  As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:  
1-36, 38, 39, 42

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-36,38,39,42

Precursor supply system and method for pulsed chemical vapour deposition in particular for atomic layer deposition employing a high conductivity particle filter.

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2. claims: 37,40

Precursor supply system for pulsed chemical vapour deposition in particular for atomic layer deposition employing a staging volume.

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3. claim: 41

Precursor supply system for pulsed chemical vapour deposition in particular for atomic layer deposition employing a thermally conductive block and an associated heater to define part of the gas flow path.

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**INTERNATIONAL SEARCH REPORT**

International Application No  
PCT/US 03/28436

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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