Title: METHOD AND APPARATUS FOR IN-SITU FILM STACK PROCESSING

(57) Abstract: Embodiments of a cluster tool, processing chamber and method for processing a film stack are provided. In one embodiment, a method for in-situ etching of silicon and metal layers of a film stack is provided that includes the steps of etching an upper metal layer of the film stack in a processing chamber to expose a portion of an underlying silicon layer, and etching a trench in the silicon layer without removing the substrate from the processing chamber. The invention is particularly useful for thin film transistor fabrication for flat panel displays.
FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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(88) Date of publication of the international search report:
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
### A. CLASSIFICATION OF SUBJECT MATTER

INV. H01J37/32 H01J37/16 H01J37/18

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)

H01J

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, INSPEC

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Relevant to claim No.</th>
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<td>US 2001/006070 A1 (SHANG QUANYUAN ET AL) 5 July 2001 (2001-07-05) abstract paragraphs [0003] - [0007], [0010], [0027] - [0031], [0037], [0039], [0040], [0044], [0047], [0049]</td>
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<td>X</td>
<td>Further documents are listed in the continuation of Box C.</td>
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* Special categories of cited documents:
  
  "A" document defining the general state of the art which is not considered to be of particular relevance
  "E" earlier document but published on or after the international filing date
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Date of the actual completion of the international search 7 April 2006

Date of mailing of the international search report 13.07.2006

Name and mailing address of the ISA/ EPO-Internal, WPI Data, INSPEC

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Authorized officer Winkelman, A

Form PCT/ISA/210 (second sheet) (April 2005)
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<td>Y</td>
<td>WO 03/012567 A (TOKYO ELECTRON LIMITED; MITROVIC, ANDREJ; LONG, MAOLIN; MOROZ, PAUL; F) 13 February 2003 (2003-02-13) abstract paragraph [0014] claims 5, 6; figure 1</td>
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INTERNATIONAL SEARCH REPORT

Box II  Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Articles 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 III  Observations where unity of invention is lacking (Continuation of item 3 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.:

   1-5

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.
This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-5

A processing chamber, comprising: a chamber body; a lid disposed on the chamber body and having a gas inlet port; a substrate support adapted to support a substrate having a processing side surface area of at least 0.25 square meters; a remote plasma source coupled to the gas inlet port; a gas distribution plate disposed in the chamber body above the substrate support; and an RF power source coupled to at least one of the gas distribution plate and substrate support.

2. claims: 6-18

A cluster tool, comprising: a transfer chamber; at least one processing chamber coupled to the transfer chamber and configured for etching both metal and silicon in-situ; a load lock chamber coupled to the transfer chamber; a factory interface coupled to the load lock chamber; a transfer robot disposed in the transfer chamber and configured to transfer substrates between the processing chamber and the load lock chamber; a interface robot disposed in the factory interface and configured to transfer substrates to the load lock chamber; and an etch residual removal station positioned to receive a substrate from at least one of the interface and transfer robots.

3. claims: 19-53

Various methods according to independent claims 19, 45, 50 and 51 for etching layers disposed on a substrate. The etching takes place in a processing chamber.
INTERNATIONAL SEARCH REPORT

PCT/US2005/011319

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