Title: LOW CONTAMINATION HIGH DENSITY PLASMA PROCESSING CHAMBER AND METHODS FOR PROCESSING A SEMICONDUCTOR SUBSTRATE

Abstract: A high density plasma processing chamber (100) including an electrostatic chuck (106) for holding a wafer (104), and consumable parts that are highly etch resistant, less susceptible to generating contamination and temperature controllable is disclosed. The consumable parts include a chamber liner (130) having a lower support section and a wall that is configured to surround the electrostatic chuck. The consumable parts also include a liner support structure having a lower extension, a flexible wall, and an upper extension. The flexible wall is configured to surround an external surface of the wall of the chamber liner, and the liner support flexible wall is spaced apart from the wall of the chamber liner. The lower extension of the liner support is however, configured to be in direct thermal contact with the lower support section of the chamber liner. Additionally, a baffle ring (132) is part of the consumable parts, and is configured to be assembled with and in thermal contact with the chamber liner and the liner support. A heater (140) is capable of being thermally connected to the liner support for thermal conducting a temperature from the liner support to the chamber liner and the baffle ring. In a most preferred embodiment, the chamber liner and the baffle ring are made from materials that are innocuous to materials on the wafer being etched. In this manner, once these materials are exposed to the energy of the high density plasma sputtering, volatile products will be produced that are substantially similar to volatile etch products produced during the etching of surface layers of the wafer. These volatile products can then be removed from the chamber.
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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.
INTERNATIONAL SEARCH REPORT

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

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<tr>
<td>Y</td>
<td>US 5 788 799 A (REDEKER FRED C ET AL) 4 August 1998 (1998-08-04) column 2, line 11-40 column 4, line 11-22 column 5, line 4-13 column 6, line 10-29 column 7, line 36 -column 813; figure 1</td>
<td>1,8,18, 21</td>
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<tr>
<td>Y</td>
<td>WO 98 14980 A (LAM RES CORP) 9 April 1998 (1998-04-09) page 4, line 2-7; figure 1 page 5, line 10-31</td>
<td>1,8,18, 21</td>
</tr>
<tr>
<td>E</td>
<td>WO 99 50886 A (LAM RES CORP) 7 October 1999 (1999-10-07) page 8, line 20 -page 9, line 15; figure 2</td>
<td>1</td>
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<th>Publication date</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>EP 0938740 A</td>
<td>01-09-1999</td>
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<tr>
<td>WO 9950886 A</td>
<td>07-10-1999</td>
<td>NONE</td>
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