Title: METHOD AND APPARATUS FOR THERMAL PROCESSING STRUCTURES FORMED ON A SUBSTRATE

Abstract: The present invention generally describes one or more apparatuses and various methods that are used to perform an annealing process on desired regions of a substrate. In one embodiment, an amount of energy is delivered to the surface of the substrate to preferentially melt certain desired regions of the substrate to remove unwanted damage created from prior processing steps, more evenly distribute dopants in various regions of the substrate, and/or activate various regions of the substrate. The preferential melting processes will allow more uniform distribution of the dopants in the melted region, due to the increased diffusion rate and solubility of the dopant atoms in the molten region of the substrate. The creation of a melted region thus allows: 1) the dopant atoms to redistribute more uniformly, 2) defects created in prior processing steps to be removed, and 3) regions that have hyper-abrupt dopant concentrations to be formed.
Published: with international search report


before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

Published: (88) Date of publication of the international search report: 8 May 2008
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - H01L 21/76 (2008.01)
USPC - 438/420

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(8) - H01L 21/76 (2008.01)
USPC - 438/420

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 practicable, search terms used)

MicroPatent

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>WO 2005/104265 A1 (SETAYESH et al) 03 November 2005 (03 11 2005) entire document</td>
<td>1-3, 7, 8, 10</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C

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 application or patent but published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

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

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

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

Document member of the same patent family

Date of completion of the international search

08 January 2008

Date of mailing of the international search report

26 FEB 2008

Name and mailing address of the ISA/US

Mail Stop PCT, Attn ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No 571-273-3201

Authorized officer

Blaine R. Copenhagen

Form PCT/ISA/210 (second sheet) (April 2007)
Continuation of Box III

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1 In order for all inventions to be examined, the appropriate additional examination fees must be paid

Group I, claims 1-21, 27-29 drawn to a method of thermally processing a substrate, comprising modifying a region of the substrate by depositing a material upon the region so as to change the thermal properties of the region

Group II, claims 22-26, 30-64, drawn to a method and apparatus for delivering heat energy to a substrate

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention modifying a region of the substrate by depositing a material upon the region so as to change the thermal properties of the region as claimed therein is not present in the invention of Group II. The special technical feature of the Group II invention a method and apparatus for delivering heat energy to a substrate as claimed therein is not present in the invention of Group I as a novel linking special technical feature

The limitation of "delivering an amount of electromagnetic energy to an area that contains a first feature and a second feature wherein the amount of electromagnetic energy causes the material within the first region to melt" is not considered a novel linking special technical feature as this limitation is clearly disclosed by US 4,849,371 A (HANSEN et al) 18 July 1989, column 7, lines 5-27

Since none of the special technical features of the Group I or II inventions are found in more than one of the inventions, unity of invention is lacking