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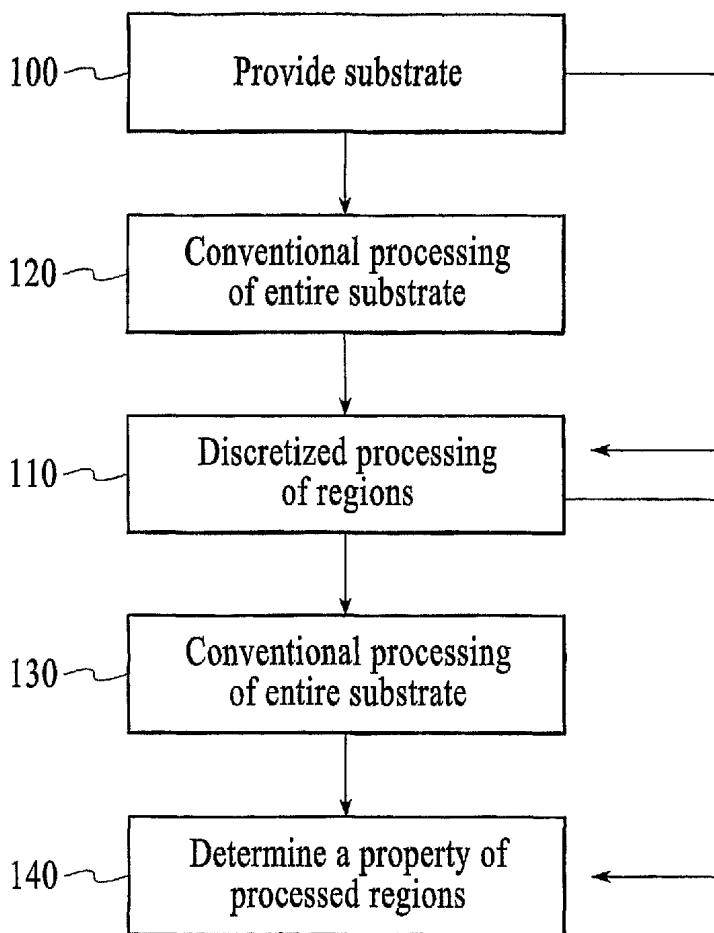
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[Continued on next page]

(54) Title: DISCRETIZED PROCESSING AND PROCESS SEQUENCE INTEGRATION OF SUBSTRATE REGIONS



(57) Abstract: The present invention provides meth-
ods and systems for discretized, combinatorial process-
ing of regions of a substrate such as for the discovery,
implementation, optimization, and qualification of new
materials, processes, and process sequence integration
schemes used in integrated circuit fabrication. A sub-
strate having an array of differentially processed regions
thereon is processed by delivering materials to or mod-
ifying regions of the substrate.

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - H01L 21/00; H01L 21/311 (2007.01)

USPC - 438/800; 438/460; 438/689

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)

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USPC: 438/800; 438/460; 438/689

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

USPC: 438/800; 438/460; 438/689 - search terms below

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PubWEST, Google Scholar, Google

Search terms:

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ----- Y	US 2003/0186501 A1 (Rueger) 2 October 2003 (02.10.2003), paras [0007]-[0008], [0019]-[0020], and [0039]-[0040].	1-4, 6-8 and 16-24 ----- 5 and 9-15
Y	US 6,794,196 B2 (Fonash et al.) 21 September 2004 (21.09.2004), col 6, 51-55; col 7, ln 18-20.	5 and 9-15
Y	US 6,306,584 B1 (Bamdad) 23 October 2001 (23.10.2001), col 22, ln 35-36 and ln 52-57.	13 and 14

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

"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

"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

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"&" document member of the same patent family

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Continuation of Box No. III

Group 1: Claims 1-24, having independent claims 1, 18, 19, 22, and 24, are directed to a method comprising: receiving a substrate; and processing at least one region of the substrate differently from at least one other region of the substrate, the processing including modifying the at least one region, wherein modifying includes at least one of physical modifications, chemical modifications, electrical modifications, thermal modifications, magnetic modifications, photonic modifications, and photolytic modifications, wherein the processing forms at least one array of differentially processed regions on the substrate. The special technical feature being processing at least one region of the substrate differently from at least one other region of the substrate.

The method of receiving a substrate and processing at least one region of the substrate differently from at least one other region of the substrate is not a special technical feature because it fails to make a contribution over the prior art. It would have been obvious to one of skill in the art to process at least one region of a substrate differently than another region of a substrate, as doing so is inherent in the process of fabricating a semiconductor substrate. Further, [see US 20030186501 A1 to Rueger 02 October 2003 (02.10.2003)]. Rueger teaches processing a center region differently from an edge region (see claim 40). Also, [see US 2003/0073277 A1 to Cho et al. (hereinafter Cho) 17 April 2003 (17.04.2003) wherein Cho teaches differences in processing a memory region and a peripheral circuitry region on a substrate. The processing of the one region differently from one other region as expressed in independent claims 1, 18, 19, 22, and 24 do not comprise a special technical feature, shared among the 3 claim groups, that would otherwise provide a unifying contribution over the prior art.

Group 2: Claims 25-48, having independent claims 25, 47, and 48, are directed to a method of forming an array of differentially processed regions, the method comprising: providing a substrate; and processing at least a portion of at least two regions of the substrate, wherein at least a portion of at least one region is processed differently from at least a portion of at least one other region, the processing including at least one of cleaning, surface modification, etching, planarization, patterning, implantation, electromagnetic irradiation, microwave irradiation, radio frequency (RF) irradiation, infrared (IR) treatment, ultraviolet (UV) treatment, deep ultraviolet (DUV) treatment, extreme ultraviolet (EUV) treatment, electron beam treatment, and x-ray treatment. The special technical feature being the processing at least a portion of at least two regions of the substrate, wherein at least a portion of at least one region is processed differently from at least a portion of at least one other region. See the discussion of set forth above regarding claim group 1.

Group 3: Claims 49-60, having independent claims 49 and 55, are directed to a method comprising: providing a substrate comprising two or more discrete regions, each region comprising a dielectric portion and an electrically conductive portion; forming a masking layer on the dielectric portion of at least one region of the two or more regions; and forming a capping layer on the electrically conductive portion of at least one region of the two or more regions, wherein at least one of the capping layer and the masking layer of at least one region is different from at least one of the capping layer and the masking layer of at least one other region. The special technical feature being forming a masking layer on the dielectric portion of at least one region of the two or more regions; and forming a capping layer on the electrically conductive portion of at least one region of the two or more regions.

Claim groups 1-3, therefore, do not share a special technical feature that would otherwise provide a unifying contribution over the prior art. Therefore, unity, as required by PCT Rule 13.1, is lacking.