US005250452A

# United States Patent [19]

Ozturk et al.

[11] Patent Number: 5,250,452
[45] Date of Patent: Oct. 5, 1993

[54] DEPOSITION OF GERMANIUM THIN FILMS ON SILICON DIOXIDE EMPLOYING INTERPOSED POLYSILICON LAYER

[75] Inventors: **Mehmet Ozturk**, Cary; **Jimmie Wortman**, Chapel Hill, both of N.C.

[73] Assignee: **North Carolina State University**, Raleigh, N.C.

[21] Appl. No.: **717,631**

[22] Filed: **Jun. 19, 1991**

**Related U.S. Application Data**

[62] Division of Ser. No. 515,595, Apr. 27, 1990, Pat. No. 5,101,247.

[51] **Int. Cl.**[5] .......... **H01L 21/441**
[52] **U.S. Cl.** .......... **437/41**; 148/DIG. 59; 148/DIG. 105; 437/238; 437/245; 437/233
[58] **Field of Search** .......... 148/DIG. 58, DIG. 59, 148/DIG. 105; 437/41, 238, 245, 962, 984, 233

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,357,179 11/1982 Adams et al. .......... 148/1.5
5,043,294 8/1991 Willer et al. .......... 437/41

FOREIGN PATENT DOCUMENTS

60-140813 7/1985 Japan .......... 148/DIG. 59

OTHER PUBLICATIONS

Dumin, D. J., "Selective Epitaxy Using Silane and Germane", *Journal of Crystal Growth* 8, pp. 33-36 (1971).
Ishii, H., et al, "Selective Ge deposition on Si using Thermal Decomposition of $GeH_4$", *Appl. Phys. Lett.* 47 (8) pp. 863-865 (Oct. 15, 1985).
Wolf, S., et al., *Silicon Processing for the VLSI Era, vol. 1:Process Technology*, pp. 174-175, 177-179 (1986).

*Primary Examiner*—George Fourson
*Attorney, Agent, or Firm*—Bell, Seltzer, Park & Gibson

[57] **ABSTRACT**

The invention is a method of depositing a layer of polycrystalline silicon on a silicon dioxide substrate until the layer of polycrystalline silicon is thick enough to support the deposition of germanium thereon, but while thin enough to substantially avoid the deleterious effects on the characteristics of semiconductor device structure that the deposition of polycrystalline silicon would otherwise potentially cause. The polycrystalline layer is then exposed to a germanium containing gas at a temperature below the temperature at which germanium will deposit on silicon dioxide alone while preventing native growth of silicon dioxide on the polycrystalline silicon layer, and for a time sufficient for a desired thickness of polycrystalline germanium to be deposited on the layer of polycrystalline silicon.

**14 Claims, 1 Drawing Sheet**