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- [54] GERMANIUM SILICON DIOXIDE GATE MOSFET
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K. Broadbent, Philips Research Lab Sunnyvale, Sig. Corp.; J. Vac. Sci. Tech. B5(6) Nov./Dec. 1987.
 Low-temperature annealing of As-implanted Ge; S. V. Hattangady and G. G. Fountain, Res. Triangle Inst.; E. H. Nicollian, Uni. of N.C.; R. H. Markunas, Res. Triangle Inst.; J. Appl. Phys. 63(1), Jan. 1, 1988.
 Metal-oxide-semiconductor field-effect transistors fabricated using self-aligned silicidic technology; B-Y. Tsaur and C. H. Anderson, Jr., Lincoln Lab. MIT; Appl. Phys. Lett. 47(5) Sep. 1, 1985.
 Radiation-Enhanced Diffusion of Boron in Germanium During Ion Implantation; M. I. Guseva and A. N. Mansurova, Durchatov Atomic Energy Inst., Moscow; Radiation Effects 1973, vol. 20, pp. 207-210.

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[56] **References Cited**
U.S. PATENT DOCUMENTS

3,505,107	4/1970	Gleim	117/212
3,967,981	7/1976	Yamazaki	357/23.9
4,005,240	1/1977	Schlacter	428/333
4,357,179	11/1982	Adams et al.	148/1.5
4,435,445	3/1984	Allred et al.	427/54.1
4,605,947	8/1986	Price et al.	357/23.15
4,637,895	1/1987	Ovshinsky et al.	252/188.31
4,696,758	9/1987	Ovshinsky et al.	252/188.31
4,698,234	10/1987	Ovshinsky et al.	427/39
4,766,008	8/1988	Kodato	427/39

OTHER PUBLICATIONS

Selective Ge deposition on Si using thermal decomposition of GeH₄; Hiromu Ishii, Yasuo Takahashi, and Junichi Murota; Appl. Phys. Lett. 47(8), Oct. 15, 1985.
 Selective Epitaxy Using Silane and Germane; D. J. Dumin; RCA Laboratories, Princeton, NJ 08540, U.S.A.; Journal of Crystal Growth 8(1971) 33-36, North-Holland Publishing Co.
 Nucleation and growth of chemically vapor deposited tungsten on various substrate materials: A review; Eliot

[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.

10 Claims, 1 Drawing Sheet

