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Improved Process for Epitaxial Deposition of Silicon on Prediffused Substrates

It is frequently desirable to fabricate integrated circuits in a silicon layer epitaxially deposited on a silicon wafer in which a heavily doped sublayer pattern has been diffused. Either of two methods has been used for the epitaxial deposition of silicon. In one method the silicon source is silane (SiH_4); in the other method, silicon tetrachloride (SiCl_4) is the silicon source. The silane reaction, nonreversible decomposition at 1000°C , produces a silicon layer with a sharp junction. This junction is desirable, as out diffusion is minimized and the original sublayer pattern is undisturbed. However, depletion of the reaction gases results in a silicon layer of varying thickness and resistivity. The silicon chloride reaction, reduction with hydrogen at 1150°C , produces a silicon layer that is uniform in both thickness and resistivity. This reaction is reversible, however, releasing and re-depositing a sufficient amount of the diffused sublayer doping to obliterate the pattern.

A new process which has been developed will uniformly deposit silicon epitaxially on prediffused substrates without affecting the sublayer pattern. In this process, approximately 2 microns of silicon are first

deposited at 1000°C from a silane source. The temperature of the substrate is then raised to 1150°C and the rest of the required silicon layer is deposited from a silicon tetrachloride source. In this manner, the sublayer diffusion pattern is protected from the silicon tetrachloride reaction.

Note:

Details may be obtained from:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
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Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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Improving Systems for Control Operations of Spacecraft in Earth Orbit

The control systems of spacecraft in Earth orbit are becoming increasingly complex. The need for improved systems is growing. This paper discusses the need for such systems and presents a new approach to their design.

The author is a member of the NASA Tech Briefs Office, Washington, D.C. 20546. He is also a member of the NASA Tech Briefs Office, Houston, Texas.

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