Self-Limiting Chemical Vapor Deposition (CVD) and Atomic Layer Deposition (ALD) Silicon on Non-Silicon Semiconductor and Metal Surfaces / 2014-117

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TECHNOLOGY DESCRIPTION

This invention provides improved procedures for the self-limiting and saturating atomic layer deposition (ALD) and self-limiting and saturating chemical vapor deposition (CVD) of a silicon seed layer on popular wafer substrates of varying alloy compositions (i.e. indium gallium arsenide, indium gallium antiminide, indium gallium nitride, and silicon-germanium), as well as germanium and metallic substrates.

ADVANTAGES

Novel features of the disclosed ALD and CVD technology:

1. Improves the current semiconductor and metal substrate surface preparation and controlled growth methods.

2. Creates a surface which is reactive to ALD precursors (Functionalization).

3. Forms a monolayer which leaves the Fermi level unpinned (Passivation). Monolayer nucleation is initiation of the ALD process in each unit cell.

4. And all three processes are done at 250°C. The self-limiting and saturating silicon CVD process at 250°C is novel as there are no similar results reported in the literature leading to saturating growth of silicon via a low temperature ALD or CVD process.

The existing silicon ALD process is at high temperature (above 350°C) and is for continuous growth of silicon on silicon and not self-limiting. It is likely this technology could be performed at even lower temperatures (for example 150C) on surface on which H2 recombinatively desorbs at lower temperatures (for example InGaAs and InAs).

APPLICATIONS

The CVD or ALD deposited silicon monolayer may be applicable for use as a semiconductor and metallic surface protection layer from unwanted oxidation. This novel technology will find a use during the deposition and processing of gate stack devices.

PATENT STATUS

Patent Pending

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OTHER INFORMATION

CATEGORIZED AS

- **Semiconductors**
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