

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 antimonide, 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 recombination 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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