Seminar 3: Deposition Processes (2)

Q1: Which gas phase and liquid phase deposition processes are applied in advanced integrated circuit technology?

Gas Phase	Liquid Phase
Sputtering (PVD)	Spin on
CVD – chemical vapor deposition	ECD – elctro chemical deposition
ALD – atomic layer deposition	EL – electroless deposition
(Gas phase) epitaxy	

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Gas Phase	Liquid Phase
CVD	Spin on
Sputtering	Electrochemical Deposition (ECD) = Electroplating = Galvanic Deposition
ALD	Electroless Deposition (EL)
Epitaxy	

Definitions:

- Step coverage (sidewall, bottom coverage)
- Conformality
- Non-uniformity (thickness) / Uniformity
- Wafer-to-wafer (WTW), within-wafer (WIW)

Seminar 1: Deposition Processes

Q2: Gas phase deposition processes: which are materials to be deposited and its applications(s) in advanced integrated circuit technology?

Gas Phase	Materials	Application	Process Module
CVD	Poly-Si Low-k dielectric W (tungsten) …	Gate electrode Isolator in interconnect systems Local interconnects / contact or via fill (vertical interconnect)	Gate formation
Epitaxy	Si p^- Si/SiGe	On p+ substrate to prevent parasitic effects Strain engineering in the channel	
ALD	High-k dielectric (HfOx) Cu …	Gate dielectric / capacitor diel. Seed layer for ECD	
Sputtering	Al	Interconnects (lines = horizontal interconnects)	

Seminar CVD: Chemical Vapor Deposition

Q3: Liquid phase deposition processes: which are materials to be deposited and its applications(s) in advanced integrated circuit technology?

Liquid Phase	Materials	Application	Process Module
Spin on	Photoresist Low-k dielectric SiO2	Masking material (lithography) Isolator in interconnect systems	
Electrochemical Deposition (ECD)	Cu	Interconnects (vias & lines = vertical & horizontal interconnects = dual damascene)	
Electroless Deposition (EL)	Cu …	Seed layer for ECD	