Deposition

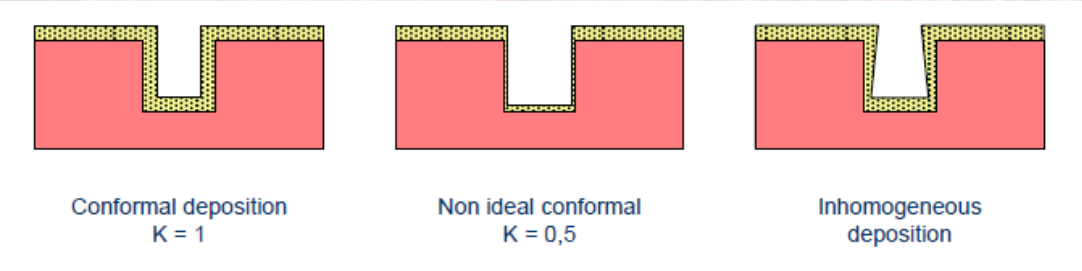
Last updated 3/7/19

Deposition

- Deposition
  - Depositing a material onto a substrate
    - Thick oxide layers (where growth by oxidation is not reasonable)
    - Polysilicon (Gate material)
    - Special materials (Si_3N_4, SiC)
  - Chemical Vapor Deposition
    - Chemical processes are used to deposit material
  - Physical Vapor Deposition
    - Mechanical processes are used to deposit material

Deposition

- Chemical Vapor Deposition
  - Gases are decomposed into constituent elements
  - The desired constituents then “settle” onto the surface of the wafer
    - Conformity – how the desired material covers vertical vs horizontal surfaces
      - K = RateV / RateH

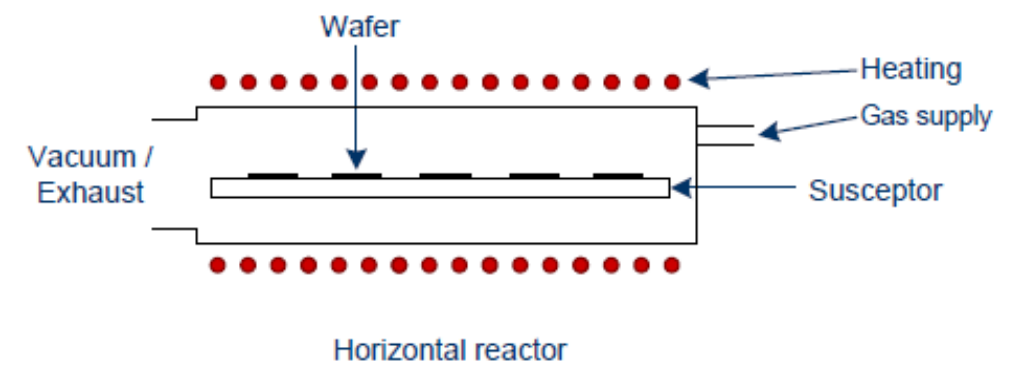


Src: www.halbleiter.org

Deposition

- Chemical Vapor Deposition
  - Atmospheric Pressure CVD (APCVD)
    - Results in low density material
    - Used for Oxide deposition

      $SiH_4 + O_2 \leftrightarrow SiO_2 + 2H_2$



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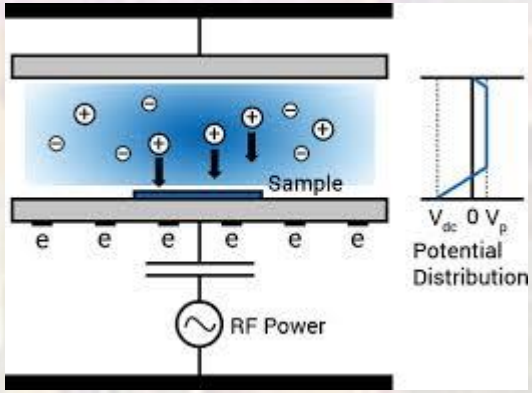
Deposition

- Chemical Vapor Deposition
  - Low Pressure CVD (LPCVD)
    - Results in high density material
    - Conformality is high due to the low pressure allows for more random particle movement
    - Used for thin films

      $4\ NH_3 + 3\ SiH_2Cl_2 \ <->\ Si_3N_4 + 6\ HCl + 6\ H_2$

Deposition

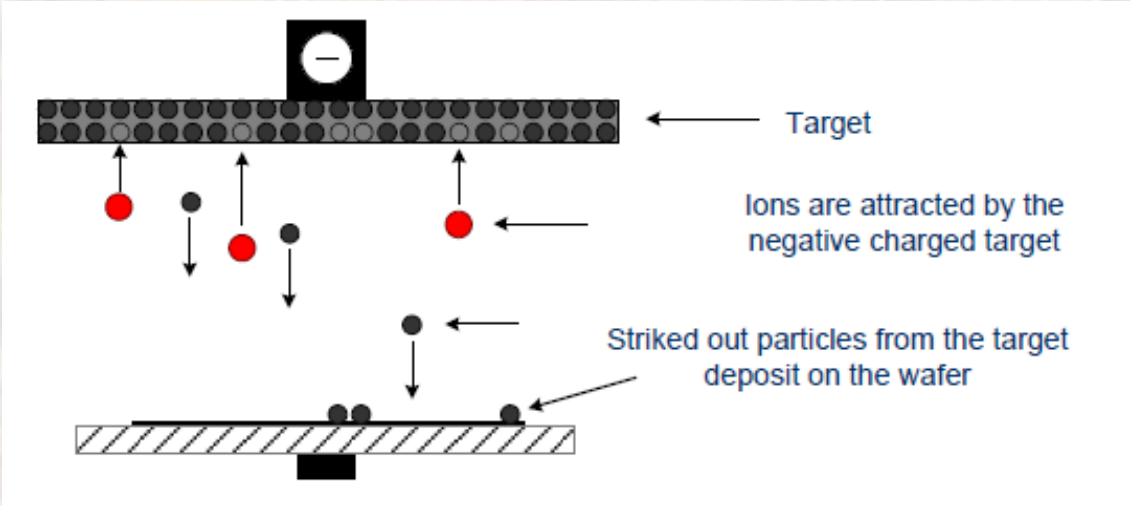
- Chemical Vapor Deposition
  - Plasma Enhanced CVD (PECVD)
    - Low temperature version of CVD
    - Gasses are decomposed (a plasma)by using a high frequency voltage
    - Used to put films on top of metal layers
      - metal cannot take the heat from other methods



src: samcointl.com

Deposition

- Physical Vapor Deposition
  - Sputtering
    - A sample of the desired material is bombarded with ions
    - The released particles then “settle” on to the wafer surface



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