

Cleaning

- Major fabrication steps in process flow that require cleaning
- Types of contamination
- Sources of contamination
- Particle removal mechanism
- Typical metal impurities
- SC-1 and SC-2 chemicals
- Principles of metal cleaning

Chemical and Mechanical Polishing

- Problems from non-planar topography
- Basic concepts about CMP
- Why do we need CMP and working mechanism
- Advantages and disadvantages of CMP
- Role of slurry and selection of chemicals in the slurry
- Polish termination
- CMP particle contaminations
- Effect of process parameters on removal rate and planarity
- Post CMP cleaning

Metrology and Analytical Techniques

- Working principle: optical, charge-based, electron beam, and ion beam
- Resolution of optical microscope
- Working principle of Ellipsometer
- Working principle of AFM
- Advantages and limitations of electron microprobe

Dielectrics for CMOS

- Limitations and problems in scaling
- Applications of oxides in CMOS
- Kinetics of oxide growth
- Thermal oxidation reaction, calculation, parameters vs rate, and characterization.
- Thermal nitridation
- Dielectric degradation mechanisms
- Requirements for MOS gate dielectrics
- Why high-k MOS gate dielectrics? Materials. Issues.
- Why low-k dielectrics? Materials. Issues.