Lecture 3: Intro to CMOS Process II

Generic Process Flow
for a CMOS Inverter

Readings: Chapter 2
Lecture 3 - Outline

- Generic Complimentary Metal-Oxide-Semiconductor (CMOS) Process:
  - Processing steps
  - N-well process flow
  - Lithographic masks
  - 3-D structures
P-substrate
P- substrate;
Oxidation;
P- substrate;  
Oxidation;  
Photoresist deposition;
P-substrate;
Oxidation;
Photoresist deposition;
Exposure;
P-substrate;
Oxidation;
Photoresist deposition;
Exposure;
Development;
Baking;
P-substrate; Oxidation; Photoresist deposition; Exposure; Development; Baking; Etching;
P- substrate;
Oxidation;
Photo-resist deposition;
Exposure;
Development;
Baking;
Etching;
Photo-resist strip;
Cleaning
P- substrate;
Oxidation;
Well - lithography:
- Photo-resist deposition;
- Exposure;
- Development;
- Baking;
- Etching;
- Photo-resist strip;
- Cleaning.
P-substrate;
Oxidation;
Well-lithography;
N-well pre-diffusion (Arsenic);
P- substrate; 
Oxidation; 
Well - lithography: 
N-well pre-diffusion (Arsenic); 
Well drive-in;
P-substrate; Oxidation; Well-lithography; N-well pre-diffusion; Well drive-in; Oxide removal
P- substrate;
Oxidation;
Well - lithography:
N-well pre-diffusion;
Well drive-in;
Oxide rm.
Well - lithography:
N-well pre-diffusion;
Well drive-in;
Oxide rm.
Oxidation
Nitride deposition;
Active litho.
Oxidation; Nitride deposition; Active litho.
  - Photo-resist deposition;
  - Exposure;
  - Development;
  - Baking;
  - Etching;
  - Photo-resist strip;
  - Cleaning
Nitride deposition;
Active litho.
Channel-stop implantation;
Nitride deposition;
Active litho.
Channel-stop implantation;
Field oxidation (FOX)
 Nitride deposition;
 Active litho.
 Channel-stop implantation;
 Field oxidation;
 Nitride rm.;
 Oxide rm.;
 Cleaning;
Nitride deposition;
Active litho.
Channel-stop implantation;
Field oxidation;
Nitride rm.;
Oxide rm.;
Cleaning;
Gate oxidation (GOX);
Gate oxidation (GOX);
Polysilicon (poly) deposition;
Poly litho;
Gate oxidation (GOX);
Polysilicon (poly) deposition;
Poly litho;
GOX oxide rm.
Gate oxidation (GOX);
Polysilicon (poly) deposition;
Poly litho;
N litho;
Negative pr.
N (Phosphorus) implantation.
Poly litho;

N litho;
- Negative pr.
- N (Phosphorus) implantation.

P litho;
- Positive pr.
- P (Boron) implantation.
Transistors
Poly litho;
N litho;
  Negative pr.
  N (Phosphorus) implantation.
P litho;
  Positive pr.
  P (Boron) implantation.
Chemical Vapor Deposited (CVD) oxide;
- CVD oxide;
- Contact Litho;
- Metal-1 deposition;
CVD oxide;
Contact Litho;
Metal-1 deposition;
Metal-1 Litho.
CVD oxide;
Contact Litho;
Metal-1 deposition;
Metal-1 Litho.
CVD oxide;
Via-1 Litho;
Metal-2 deposition;
Metal-2 Litho.
Over-glass deposition/litho.
Inverter