Deposition of Metals

Benjamin A. Small
Cleanroom Technical Staff
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Contact Information

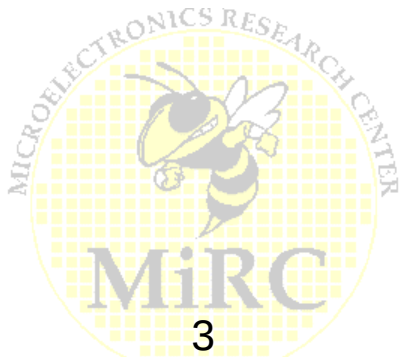
processing@grover.mirc.gatech.edu

http://grover.mirc.gatech.edu/processinfo/

Gary's office

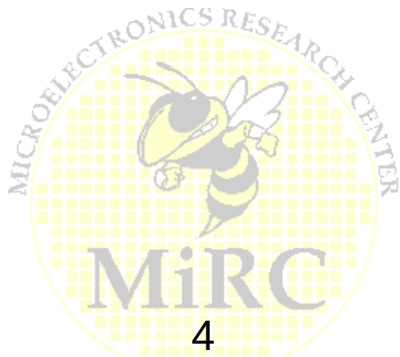
Outline

- Applications
- Physics
- Mechanics
- Data
- Warnings
- Comments

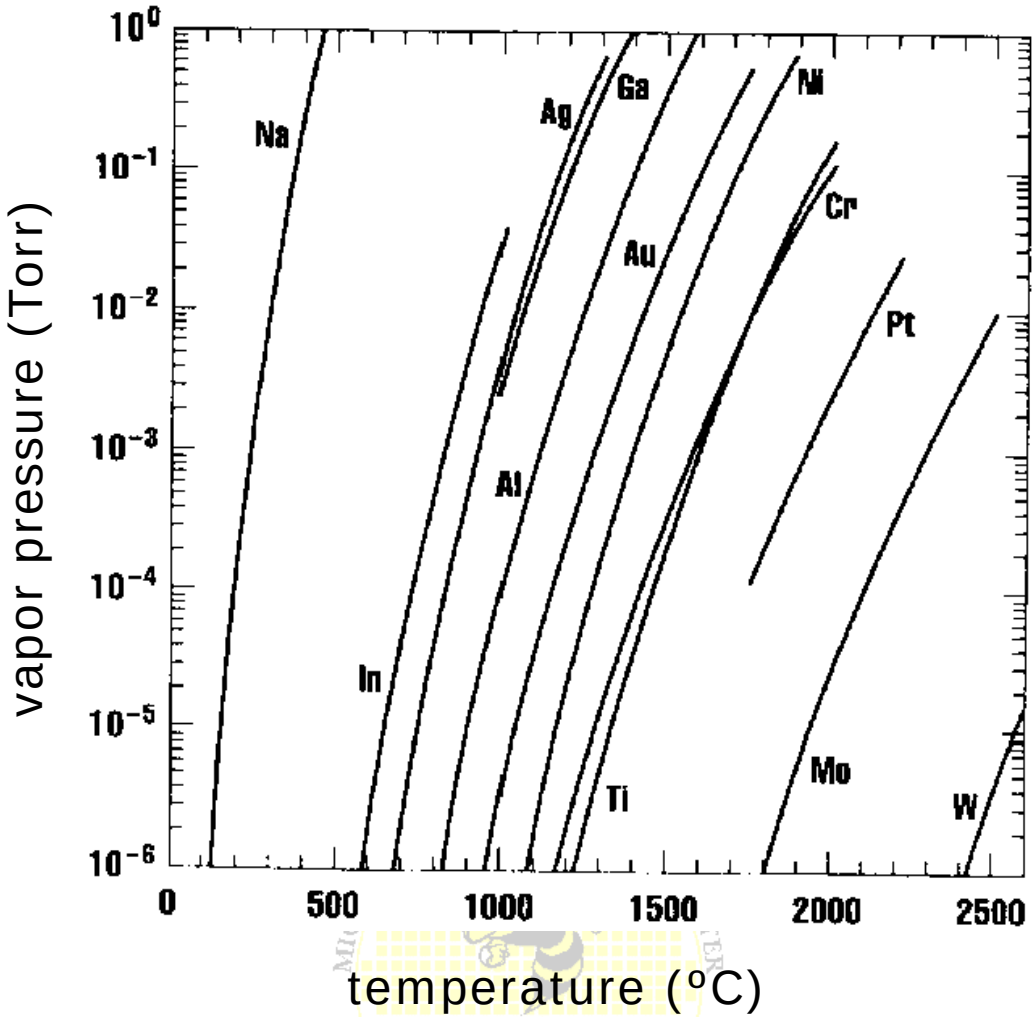


Applications

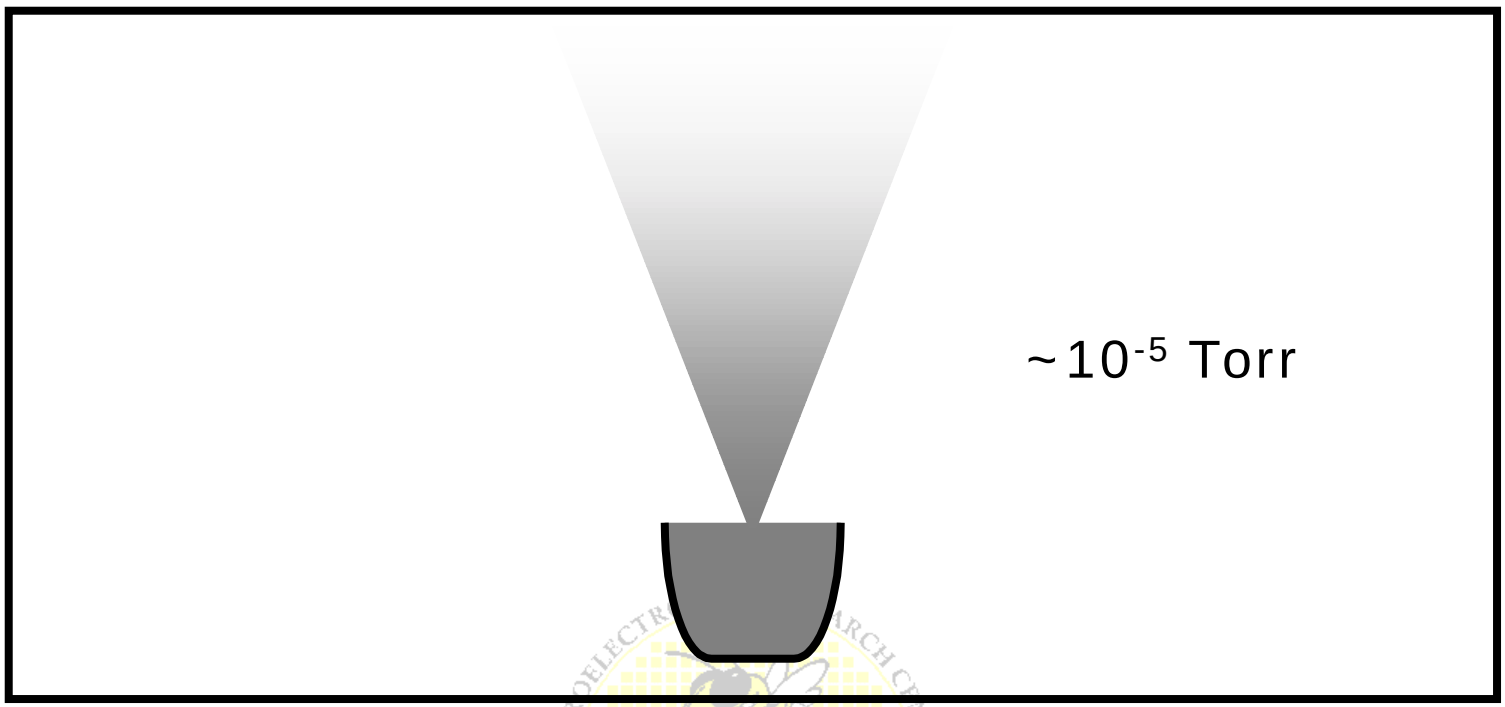
- Contacts and traces
- Etch mask
- MEMS components
- Seed layer



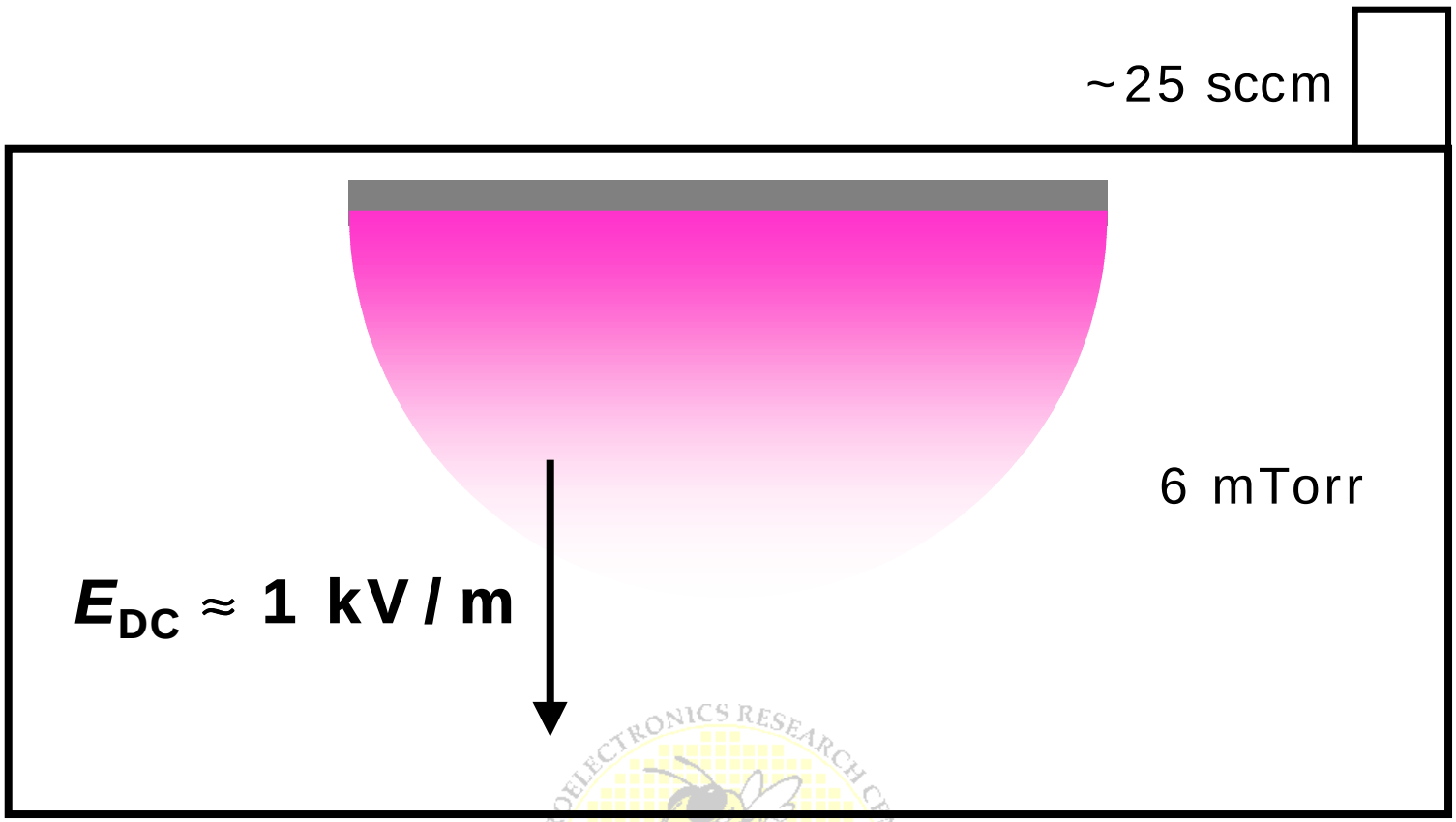
Physics


vapor pressure (Torr)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
Na
Ag
Ga
Ni
Cr
Au
Pt
Al
In
Ti
Mo
W
0
500
1000
1500
2000
2500
temperature (ºC)

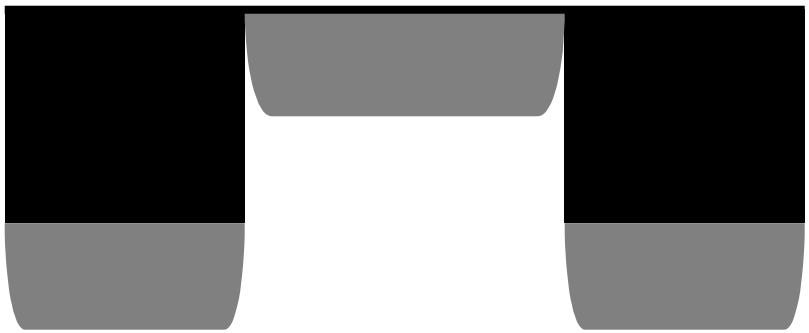
Mechanics



Mechanics

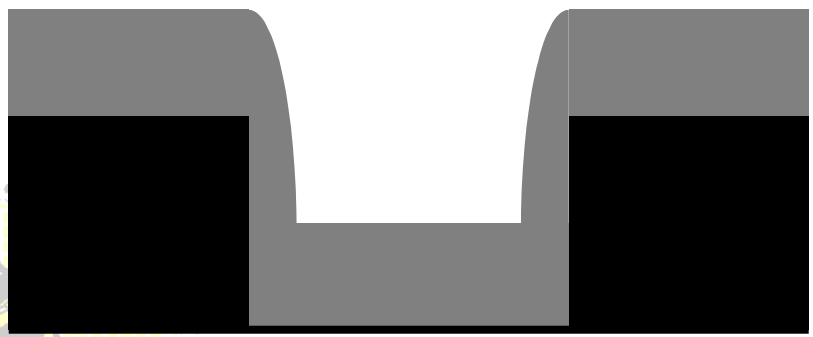


Mechanics



evaporation

sputtering



E-Beam Evaporator

Al, Au, Cr, Cu, Ni, Pt, Ti

Filament Evaporator

Au, Cr, Cu, In, Ni, alloys

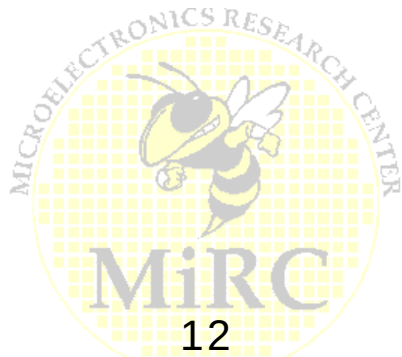
DC Sputterer

8”: Al, Cu

3”: Ag, Al, Au, Cr, Cu, Ni, Ni-Cr, Ni-Fe, Pt, Ta, Ti

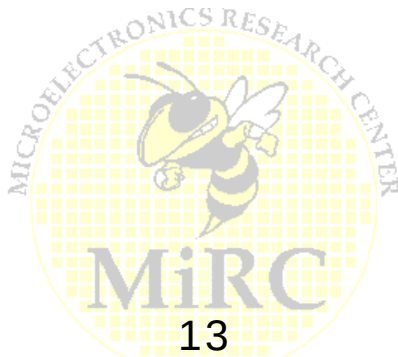
Data (Sputterer)

Al (6”), 40 %:	7.1 Å/s
Cu (6”), 40 %:	11.6 Å/s
Ti (3”), 7 %:	1.6 Å/s
Cr (3”), 7 %:	1.8 Å/s
Ni (3”), 7 %:	1.6 Å/s



Considerations

- Pump-down takes between 30 minutes and one hour
- The filament evaporator is not as user-friendly as the e-beam
- The filament evaporator requires less source material than the other systems
- The tungsten filament may alloy with source metal
- The evaporators are more directional than the sputterer



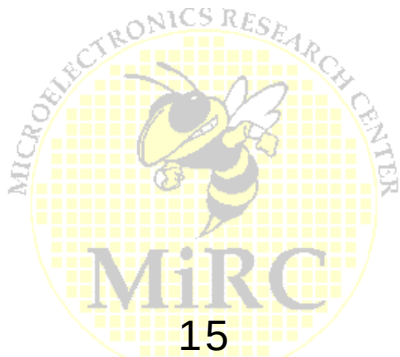
Warnings

- Allow metal sources to cool before venting
- Do not over-fill crucibles
- Align crucibles properly
- Center electron beam in crucible
- Do not allow pellets to fall down into hi-vac valve

- Metal should not be allowed to pass under the rotostrate to the heater.
- Do not over-tighten target shield on sputterer
- Samples must be thin enough to pass under the shutter

Recommendations

- Be observant
- Load samples into center of chamber
- Confirm rates before an important run
- Change sensor crystal after 10 µm or before important tests



Bibliography

Campbell, Stephen A. *The Science and Engineering of Microelectronic Fabrication.* 1996.

http://grover.mirc.gatech.edu/equipment/