

Materials in the SMFL

The SMFL sees many types of substrates and materials. Some pose cross-contamination threats.

We detail here the specifics on processing certain materials in the SMFL.

 *All tools in the SMFL have a list of accepted materials. If your material/substrate is not on the accepted list for the tool, you may not run it.*

Generally Accepted Materials

Refractory Metals

- This includes Tungsten, Molybdenum, Tantalum, (and Titanium)
- These metals have very high melting points and are generally very stable.
- They are allowed in most equipment with a few exceptions (MOS RCA Bench, Gate Oxide Tube)

Aluminum

- Aluminum is a commonly deposited metal in the SMFL. This includes Al/Si alloys as well.
 - Substrates with Al should not be taken above 600C
 - Substrates with Al or that have had Al should not be processed in the MOS RCA Bench or processed in Tubes 1, 4, or 6
 - Aluminum contamination from RCA cleaning baths has been shown to have detrimental effects on thin gate oxides.

Restricted Materials

Copper

 Copper is very mobile in silicon at lower temperatures and can cause serious degradation of device properties.

- Carrier lifetimes are greatly reduced and gate oxides break down sooner at low levels of copper contamination.
- Copper can even be deposited on wafers through baths such as HF. It can then make its way into high temperature furnaces and contaminate the quartzware and even the heating coils where it then contaminates other wafers on an ongoing basis.
- Copper is in a high contamination threat class of materials and as such is tightly controlled in the SMFL.
- Chemicals used to etch copper films may not be poured down the lab drains - please contact the SMFL staff before you etch your copper film for a dedicated waste container.

 Users wishing to process copper in the SMFL should contact the staff and present a detailed process flow.

- Substrates with copper are allowed in very few tools and your process must be discussed before you start any work.

Gold

 Gold is similar to copper in that it can be deposited on wafers through baths such as HF. It can then make its way into high temperature furnaces and contaminate the quartzware and even the heating coils where it then contaminates other wafers on an ongoing basis.

- Gold is used in semiconductor processing, it is used to make fast switching devices, it is used for contacts and it has found uses in biological applications.
- Gold introduces deep traps which act as recombination centers for electron/hole pairs which shut off the current in the device quickly. It comes at the expense of increased leakage, low breakdowns, and poor low current performance.
- Gold diffusivity is very high in silicon at lower temperatures.

 Users wishing to process gold in the SMFL should contact the staff and present a detailed process flow.

- Substrates with gold are allowed in very few tools and your process must be discussed before you start any work.

High Vapor Pressure Materials

- These are metals that are not allowed in our standard PVD systems. We do have one system that is used to deposit zinc.
- They have vapor pressures high enough at lower temperatures that once they are in a PVD system - they will continually re-deposit on subsequent substrates.
- These materials are restricted in what tools they may be processed in. Please contact the staff and present a detailed process flow.
- Includes
 - Selenium
 - Cadmium

- Zinc
- Lead
- Tin
- Lithium

Gallium Arsenide

- As both Gallium and Arsenic are silicon dopants, these substrates are generally processed separately. This is especially true for any wet chemical processing.
- It is especially important that no arsenic etchants go into our neutralization system, they must be bottled up and disposed of with our waste contractor.