SJ-26 Evaporator - System Overview

The SJ-26 is an E-beam evaporator used for depositing Al2O3, MgF, SiO2, SiO, Ge, Au, Pd, Pyrex, ZnSe and Ti. Although the SJ-26 is unique among our evaporators in that it does insulators and semiconducting materials, the tool uses the same principals as other evaporators: Electrons created by a filament are accelerated onto the top surface of the material. These electrons heat the top surface of the source metal, causing evaporation of the material which will condense onto the substrate. Evaporation is done under vacuum to allow the evaporated materials a clear path to the substrate and to reduce impurities in the film as it is being deposited.

Due to the directional nature of the deposition, evaporated films are more "line of sight" when deposited onto topography. This means that evaporated films have poor gap fill and often do not coat vertical sidewalls of tall features or deep vias. These properties make the tool a poor candidate to give uniform coatings on non-flat substrates but make the tool ideal to use for lift-off applications.

All the evaporators in the MNF use thin films controllers with quartz crystal monitor feedback. These controllers pre-heat the source materials with the shutter closed. Then, during deposition, the controller uses the feedback from the crystal monitor and varies the e-beam power to maintain a steady, preset deposition rate and to determine the total evaporation time.

Features of the tool:

- Cryo-pumped box coater capable of 10-6 Torr base pressure in 2 hrs of pumping
- 4 15CC pocket E-beam gun to allow 4 different materials to be deposited in one run
- Large distance from source and curved substrate dome designed for liftoff applications
- Brookes Automation Controller to allow programmable multilayers
- Optional Jig setup to allow single-wafer runs of thicker material.

Tool details:

Parameter	Details
Materials Supported	Aluminum Oxide (Al2O3) (3000Å MAX Dome, 2um MAX Jig) Magnesium Flouride (MgF) (1um MAX Dome, 3um MAX Jig) Silicon Dioxide (SiO2) (2000Å MAX Dome, 1um MAX Jig) Silicon Monoxide (SiO) (2000Å MAX Dome, 1um MAX Jig) Germanium (Ge) (4000Å MAX Dome) Gold (Au) (4000Å MAX Dome, 2um MAX Jig) Palladium (Pd) (2000Å MAX Dome) Pyrex (Px) (1um MAX Dome, 3um MAX Jig) Zinc Sellenide (ZnSe) (1um MAX Dome, 3um MAX Jig) Titanium (Ti) (1um MAX Dome, 3um MAX jig)
Material Properties	See Calibration logs for thickness, uniformity and resistance data
Substrate Size	Pieces up to 4" wafers. Tool holds 9 4" wafers
Typical Cycle time	Total: 3+ hrs Pump down: 2 hrs. Load/Depostion: 0.75-1.75 hrs

SJ-26 Evaporator - General Operating Procedures

NOTE: SJ-26 Uses Brookes Automation System – More details can be found in "Reference" Section of this manual or through training

1. Vent and Load
    a. Enter Password <return>
    b. From Menu choose – *Direct Control* → *Run* → *Ventup* – wait for chamber to vent
    c. Verify all Gun Pockets are loaded with proper materials and filled properly
        i. Use *Direct Control* and use arrow keys to scroll down to shutter and gun advance for Gun 2 - this will allow you to open-close shutter and advance the pockets
        ii. Take care on all source changes because many materials are crystalline. Vacuum all pockets on source change
    d. Vacuum any debris in chamber and bottom of shutter.
        i. Don't forget to close the shutter
    e. Verify that X-tal life is <20. Change X-tal if necessary.
    f. Load substrates on Dome or Jig. Use Dome Rotation on screen and speed knob on controller to rotate the dome for loading. Return speed to full clockwise
    g. Shut chamber door. Then *Run* → *Autopump* Pumping takes a moment to start
    h. Pump for at least 2 hours

2. Deposition Operation
    a. *Hints*: The SJ-26 automation requires more training than typical evaporators
        i. In general use <Esc> to get to *Direct Control* <Return> in most cases
        ii. Highlight commands and hit <Return> to input numbers, data, etc.
        iii. Instructions during deposition will appear at the bottom of the screen
        iv. Always follow instructions and then use <Esc> to get to *Direct Control* then *Resume*
    b. Verify Ion Gauge pressure and that Ion Gauge controller lights are steady in color
    c. Start Deposition Sequence *Direct Control* → *Run* → *"Program Name"*
        i. Typical programs are **Gun2Multi_5** or **Stack** for dome depositions
    d. Follow the prompts on the screen
        i. Read all instructions on screens and follow them before doing <Esc> → *Direct Control* → *Resume*
        ii. Typically you will need to change the sweep, power up the gun, etc. Remember that the primary gun in the tool is Gun#2

3. Run Completion and Vent-up
    a. Let gun cool down for 5 minutes.
    b. Turn Off Simba Remote Toggle switch
    c. From Menu choose – *Direct Control* → *Run* → *Ventup* – wait for chamber to vent
    d. Unload Samples, inspect chamber, log X-tal life
    e. Shut chamber door. Then *Run* → *Autopump* Pumping takes a moment to start
    f. Push Esc key to exit system – DO NOT Exit PAL Automation system
    g. Turn down monitor screen brightness
    h. Verify that system has crossed over into high-vacuum after a few minutes.