VACUUM CHAMBER PM TECHNIQUE
Novellus INOVA PVD Process Chamber

OBJECTIVE:
TO EFFECTIVELY PM THE NOVELLUS INOVA PVD PROCESS CHAMBER IN A TIMELY MANNER, WHILE IMPROVING TOOL RECOVERY AND PARTICLE PERFORMANCE

Vacuum Chamber: NOVELLUS INOVA PVD
Vacuum Chamber Process Residue: PROCESS INDUCED RESIDUE
Vacuum Chamber Components: PROCESS CHAMBER

Old Procedure: 3 to 4 hours using Scotch-Brite™ & IPA with 100+ wipes
Tool Recovery: 6 to 8 hours conditioning wafers to pass particle specs

New Procedure: 1 to 2 hours using ScrubPAD, UltraSOLV® Sponge DI water & IPA with 25 MiraWIPES®
Tool Recovery: <4 hours conditioning wafers to pass particle specs

Vacuum Chamber Products:
NOVELLUS INOVA PVD CHAMBER PM KIT
1. HT4536D-10-1 360 Grit Diamond ScrubPAD
2. HT174936D-1 360 Grit Diamond ScrubTIP®
3. FTPEN-1 ScrubWRIGHT® PEN
4. HT4580DW-1 800 Grit Diamond ScrubBELT®
5. HT4754 UltraSOLV® Sponge
6. HT1511FC-5 MiraSWABS® (20 MiraSWABS®)
7. HT5790S-25 MiraWIPES® (25 MiraWIPES®)
8. HT4790-5 UltraSOLV® Foam Wipers (5 Wipers)
NOVELLUS INOVA PVD PROCESS CHAMBER PM PROCEDURE:

View “How to” instructional videos on http://www.foamtecintlwcc.com/flash/

**Step 1:** Using proper procedures and safety guidelines, shutdown and prepare Novellus INOVA PVD process chamber for wet clean

INOVA UPPER CHAMBER RING SCRUB:

**Step 2:** Remove INOVA PVD ANODE ADAPTER from process chamber and stage on mounting assembly in preparation for wet clean (See Fig 1)

**Step 3:** Fill FT1301 plastic container with approximately 12oz of DI water and place on protective pad next to working area (See Fig 2)
Novellus INOVA PVD Process Chamber PM Procedure (cont’d):

**Step 4:** Place [HT4536D](#) 360 Grit Diamond ScrubPAD and [HT4754](#) UltraSOLV® Sponge in container of DI water to moisten products (See Fig 3)

![Fig 3: Placing Diamond ScrubPAD and UltraSOLV® Sponge in container of DI water](image)

**Step 5:** Use *lightly dampened* UltraSOLV® Sponge and wipe area of anode adapter that is to be cleaned (See Fig 4)

![Fig 4: Lightly dampened UltraSOLV® Sponge wiping anode adapter](image)

**Step 6:** Take *lightly dampened* 360 Grit Diamond ScrubPAD and scrub deposition off of anode adapter (See Fig 5)

![Fig 5: Lightly dampened ScrubPAD scrubbing off deposition](image)
**NOTE:** REMEMBER IT IS NOT NECESSARY TO USE A LOT OF DI WATER DURING THIS SCRUB PORTION OF THE PM, ONLY ENOUGH TO KEEP DIAMOND SCRUBPAD MOIST

**Step 7:** After scrubbing a small area with the 360 Grit Diamond ScrubPAD, use the lightly dampened UltraSOLV® Sponge and wipe deposition from the scrubbed area (See Fig 6 & 7)

**NOTE:** THIS STEP WILL ELIMINATE THE USE OF 100+ WIPERS AS THE SPONGE CAN BE REUSED DURING THE SCRUB PORTION OF THE PM

**Step 8:** As Diamond ScrubPAD loads-up with deposition, pull ScrubPAD across damp UltraSOLV® Sponge to properly unload (See Fig 8, 9 & 10)
NOVELLUS INOVA PVD PROCESS CHAMBER PM PROCEDURE (CONT’D):

**Step 9:** Ensure to unload UltraSOLV® Sponge as much as possible by placing it back in container of DI water and **RINSE-OUT** thoroughly (See Fig 11 & 12)

![Fig 11: UltraSOLV® Sponge loaded with deposition](image1)

![Fig 12: UltraSOLV® Sponge AFTER rinse](image2)

**Step 10:** Repeat steps 4 – 9 for all remaining areas throughout PVD anode adapter. Unload ScrubPAD and UltraSOLV® Sponge as necessary

**Step 11:** When scrub portion of wet clean is complete, prepare anode adapter for Final Wipe by rinsing out UltraSOLV® Sponge with fresh DI water and performing a complete final anode adapter wipe using the dampened UltraSOLV® Sponge

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**IMPORTANT NOTE**

MUST USE HT5790S MiraWI PES® AND HT1511FC MiraSWABS® DURING WIPE PORTION OF PROCEDURE TO EFFECTIVELY REMOVE PARTICLE DEFECTS FROM NOVELLUS INOVA PVD PROCESS CHAMBER
INOVUS INOVA PVD PROCESS CHAMBER PM PROCEDURE (CONT'D):

INOVUS INOVA ANODE ADAPTER WIPE:

**NOTE:** Below is an example of the particles the HT1511FC MiraSWAB® was able to remove from the adapter shield pin grooves in the NOVELLUS INOVA PVD ANODE ADAPTER (See Fig 13 & 14)

![Image of HT1511FC MiraSWAB® removing particles from a groove](image1)

**Fig 13 & 14:** What the HT1511FC MiraSWAB® was able to effectively remove from upper chamber ring

MiraSWABS® are a KEY STEP for DEFECT REDUCTION and IMPROVED TOOL RECOVERY

**NOTE:** Important to use HT1511FC MiraSWABS® before HT5790S MiraWIPE® as the MiraSWABS® will be lifting particles out of the hard to reach areas and will have to be followed by wiping with the MiraWIPE®

Step 12: Dampen the HT1511FC MiraSWAB® with IPA and wipe out the hard to reach areas, such as adapter shield pin grooves, o-ring grooves, screw holes and tight corners (See Fig 15)

![Image of MiraSWAB® wiping out a groove](image2)

**Fig 15:** MiraSWAB® wiping out adapter shield pin grooves
**NOTE:** Figure below shows how much more deposition the Foamtec International MiraWIPE® can remove from a critical surface compared to the standard fab wiper, making the MiraWIPE® Final IPA Wipe the most **CRITICAL STEP** of the PM procedure (See Fig 16a & 16b)

**Fig 16a:** Current fab wiper after completely wiping process chamber

**Fig 16b:** Particles picked up using HT5790S MiraWIPES® after completely wiping with current fab wiper

**MiraWIPES® are another KEY STEP for DEFECT REDUCTION and IMPROVED TOOL RECOVERY**

**Step 13:** Fold the HT5790S MiraWIPE® into quarters and dampen with IPA

**NOTE:** IMPORTANT TO FULLY SATURATE THE MiraWIPE® WITH IPA. THE MICROFIBER CHARACTERISTICS ARE MORE ABSORBENT AND WILL HOLD MORE IPA THAN ANY STANDARD FAB WIPER, HELPING TO PERFORM A MORE EFFECTIVE FINAL WIPE

**Step 14:** Using the IPA dampened MiraWIPE®, wipe down all areas of the anode adapter, be sure to refold the MiraWIPE® as necessary to expose a clean side of the MiraWIPE® as you wipe within the chamber

**NOTE:** REPLACE WITH A NEW DAMPENED MiraWIPE® AS NECESSARY

**Step 15:** Repeat above MiraWIPE® & MiraSWAB® final wipe procedure on all remaining areas of Novellus INOVA Anode Adapter
**NOVELLUS INOVA PVD PROCESS CHAMBER PM PROCEDURE (CONT’D):**

**INOVA PVD CHAMBER SCRUB:**

**Step 16:** Empty container of DI water in approved waste disposal sink and replace with fresh DI water (See Fig 17)

**Fig 17:** FT1301 plastic container with fresh DI water

**Step 17:** Take 2\textsuperscript{nd} HT4536D 360 Grit Diamond ScrubPAD and HT4754 UltraSOLV\textsuperscript{®} Sponge and place in container of fresh DI water (See Fig 18)

**Fig 18:** Placing Diamond ScrubPAD and UltraSOLV\textsuperscript{®} Sponge in container of fresh DI water

**NOTE:** If UPPER EDGE OF PVD CHAMBER DOES NOT CONTAIN A RING OF HARD WHITE BUILDUP THEN PROCEED TO STEP 20 (See Fig 19)

**Fig 19:** Ring of hard white buildup along top edge of PVD process chamber
Step 18: Take lightly dampened UltraSOLV® Sponge and wipe ring of hard white buildup along top edge of PVD process chamber (See Fig 20)

Step 19: Use lightly dampened 360 Grit Diamond ScrubPAD and scrub off hard white buildup along top edge of chamber (See Fig 21)

Step 20: When white ring on top edge of process chamber has been removed, use the same technique with the UltraSOLV® Sponge and ScrubPAD to remove any process buildup throughout chamber (See Fig 22)
NOTE: UNLOAD DIAMOND SCRUBPAD AND ULTRASOLV® SPONGE USING THE SAME METHOD DESCRIBED ABOVE

Step 21: For small areas and tight corners, such as the chamber flange, place the HT4580DW-1 800 Grit Diamond ScrubBELT® onto the FTPEN-1 ScrubWRIGHT® Pen and scrub these areas with the tip of the ScrubWRIGHT® Pen. Use the same unloading procedure for the ScrubBELT® as described above and ensure to rotate the ScrubBELT® as necessary to prevent from breaking (See Fig 23, 24 & 25)

Step 22: Use a 3rd 360 Grit Diamond ScrubPAD, lightly moistened with DI water, to scrub outer edge of the ceramic e-chuck (See Fig 26)
NOVELLUS INOVA PVD PROCESS CHAMBER PM PROCEDURE (CONT’D):

Step 23: Use the UltraSOLV® Sponge, lightly dampened with DI water, in the same manner as described above to wipe the edge of the ceramic e-chuck

Step 24: Take a HT174936D-1 360 Grit Diamond ScrubTIP® to clean the lift pin holes around the edge of the e-chuck (See Fig 27)

Step 25: In preparation for the final wipe, take a certified house vacuum and vacuum out all the areas throughout the PVD process chamber where DI water and/or particles may have accumulated (See Fig 28)
**IMPORTANT NOTE**

MUST USE HT5790S MiraWI PES® AND HT1511FC MiraSWABS® DURING FINAL WIPE PORTION OF PROCEDURE TO EFFECTIVELY REMOVE PARTICLE DEFECTS FROM NOVELLUS I NOVA PVD PROCESS CHAMBER

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**INOVA PVD PROCESS CHAMBER WIPE:**

**NOTE:** Below is an example of the particles the HT1511FC MiraSWAB® was able to remove from the hard to reach tight areas in the Novellus I NOVA PVD Process Chamber (See Fig 29)

![Image](image_url)

**Fig 29:** What the HT1511FC MiraSWAB® was able to effectively remove from PVD process chamber

MiraSWABS® are a KEY STEP for DEFECT REDUCTION and IMPROVED TOOL RECOVERY

**NOTE:** Important to use HT1511FC MiraSWABS® before HT5790S MiraWI PES® as the MiraSWABS® will be lifting particles out of the hard to reach areas and will have to be followed by wiping with the MiraWI PE®
NOVELLUS INOVA PVD PROCESS CHAMBER PM PROCEDURE (CONT’D):

Step 26: Dampen the HT1511FC MiraSWAB® with IPA and wipe out the hard to reach areas, such as ESC lift pin holes, holes at the bottom of the chamber, PVD changer flange and o-ring grooves (See Fig 30, 31, 32, 33 & 34)

Fig 30, 31, 32, 33 & 34: MiraSWAB® wiping out ESC lift pin holes, holes on bottom of chamber and PVD chamber flange
NOTE: Figure below shows how much more deposition the Foamtec International MiraWIPE® can remove from a critical surface compared to the standard fab wiper, making the MiraWIPE® Final IPA Wipe the most CRITICAL STEP of the PM procedure (See Fig 35a & 35b)

**Fig 35a:** Current fab wiper after completely wiping process chamber

**Fig 35b:** Particles picked up using HT5790S MiraWIPES® after completely wiping with current fab wiper

MiraWIPES® are another KEY STEP for DEFECT REDUCTION and IMPROVED TOOL RECOVERY

Step 27: Fold the HT5790S MiraWIPE® into quarters and dampen with IPA

**NOTE:** IMPORTANT TO FULLY SATURATE THE MiraWIPE® WITH IPA. THE MICROFIBER CHARACTERISTICS ARE MORE ABSORBENT AND WILL HOLD MORE IPA THAN ANY STANDARD FAB WIPE HELPING TO PERFORM A MORE EFFECTIVE FINAL WIPE

Step 28: With the IPA dampened MiraWIPE®, wipe down all areas of the PVD process chamber, including chamber pass-through; be sure to refold the MiraWIPE® as necessary to expose a clean side of the MiraWIPE® as you wipe within the chamber (See Fig 36 & 37)

**Fig 36 & 37:** Using IPA saturated MiraWIPE® to completely wipe out PVD process chamber
NOTE: REPLACE WITH A NEW DAMPENED MiraWIPE® AS NECESSARY

Step 29: Repeat above MiraWIPE® & MiraSWAB® final wipe procedure on all remaining areas of Novellus INOVA PVD Process Chamber

NOTE: IT IS EXTREMELY CRITICAL TO WIPE THE PVD PROCESS CHAMBER CERAMIC E-CHUCK WITH THE UltraSOLV® FOAM WIPER, TO PREVENT FROM GENERATING AND LEAVING FIBERS IN THE PROCESS CHAMBER (SEE FIG 38)

![Fig 38: Fiber generated from wiping e-chuck with standard fab wiper](image)

NOTE: USING THE UltraSOLV® FOAM WIPE TECHNOLOGY IS AN EXCELLENT TECHNIQUE TO HELP MINIMIZE BACKSIDE PARTICLES

Step 30: Take the UltraSOLV® foam wiper and fold into quarters (See Fig 39 & 40)

![Fig 39: UltraSOLV® Foam Wiper](image)

![Fig 40: UltraSOLV® Foam Wiper folded into quarters](image)
NOVELLUS INOVA PVD PROCESS CHAMBER PM PROCEDURE (CONT’D):

Step 31: Dampen the UltraSOLV® foam wiper with IPA and wipe the top and sides of the e-chuck by **PULLING** the foam wiper across the e-chuck (See Fig 41)

![UltraSOLV® Foam Wipe being PULLED across e-chuck](image)

**NOTE:** IT IS NECESSARY TO PULL THE FOAM WIPER ACROSS THE E-CHUCK AS THE CHARACTERISTICS OF THE FOAM WIPER WILL NOT ALLOW THE WIPER TO BE PUSHED

**NOTE:** REFOLD FOAM WIper AS NECESSARY TO EXPOSE A NEW AREA OF THE WIper AFTER EACH SECTION HAS BEEN USED

Step 32: Using proper procedures and **safety guidelines** bring PVD Process Chamber back up to production