Arizona State University NanoFab

AS-ONE150 RTP STANDARD OPERATION PROCEDURE

Rev C

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1. Purpose / Scope

1.1. This document describes the procedures that must be followed to operate the AnnealSys AS-One 150 RTP (Rapid Thermal Process).

1.2. Tool Capabilities

1.2.1. Substrates and materials. The AS-One150 is a contaminate free tool. Therefore, material usage in this tool is restricted. Under no circumstance process material through this tool that has gold, silver, copper, tin, indium, or compounds of these materials. Individuals found doing so will be responsible for replacing components thought to be contaminated.

1.2.2. Sample sizes.

1.2.2.1. Graphite susceptor will hold small pieces and substrates up to a 150mm in diameter.

1.2.2.2. Scroll Pump - The scroll pump is used to pump down the chamber to ≈5mT. The pump is not used during anneal.

1.2.3. Available Purge Gases.

1.2.3.1. Argon

1.2.3.2. Forming gas (N2 95% / H2 5%)

1.2.3.3. Nitrogen

1.2.3.4. Oxygen (Please consult NanoFab Staff prior to using O2)

1.2.4. Allowable temperature range ➔ 300 °C to 1000 °C.

1.2.4.1. Maximum temperature ramp rate using a graphite susceptor is 20 °C/second.

1.2.4.2. Maximum temperature ramp rate using a silicon wafer is 40 °C/second.

1.2.5. Allowable Anneal Times

1.2.5.1. 300 °C to 600 °C < 1 hour

1.2.5.2. 600 °C to 800 °C < 30 minutes

1.2.5.3. 800 °C to 1000 °C < 5 minutes.

2. Reference Documents

2.1. None

3. Equipment / Supplies / Material

3.1. Supplied PEEK tweezers.

3.1.1. Do not remove PEEK tweezer from tool!

3.2. Use the appropriate non-metal tweezers to handle samples.

4. Safety

4.1. DO NOT leave the tool when running a recipe.

4.2. Burn Hazard

4.2.1. Substrate, susceptor and quartz window may be at elevated temperatures. Wait a sufficient cool down time before handling any material.

5. Set Up Procedures

5.1. Launch the AnnealSys AS-One150 software by double clicking on the icon on the desktop.

5.1.1. The icon is located on the Windows desktop.

5.1.2. Enter your unique "Login Name" and "Password" than select "OK".

5.1.2.1. Do not share your login name and passwords with other users.

5.2. Annealsys software pages

5.2.1. Recipes ➔ Contain the recipe editor

5.2.2. Process ➔ Contain all the functions to operate the tool.

5.2.3. Historical ➔ All of your previous runs are archived here

5.2.4. Configuration ➔ Used by Staff ONLY

5.2.5. Manual Mode ➔ Used by Staff ONLY

5.2.6. Diagnostics ➔ Used by Staff ONLY

6. Operation Procedures

6.1. Load Sample

6.1.1. Ensure that the "Process" page is selected.

6.1.2. Select "Purge until ATM". The Pirani-Cap value will increase to approximately 760Torr.

6.1.3. Select "Purge" to keep continuous N2 purge.

6.1.4. Select "Unlock". The unlock sequence only works if the chamber is at atmosphere. Listen for the sound of the unlock solenoid.

6.1.5. Carefully open the chamber by using the handle.

6.1.5.1. Gently open the chamber all the way up.

6.1.6. Ensure that the susceptor is cool.

6.1.7. Remove susceptor lid and place it on the landing pad. (use the supplied tweezers)

NOTE: The susceptor is a very costly and fragile item. Handle it with care!

6.1.8. Place sample on the recessed area of the susceptor using non-metal tweezers.

6.1.9. Replace the susceptor lid. (Again, using the tweezers provided)

6.1.10. Slowly and carefully, close chamber using the handle.

6.1.11. Turn "OFF" the purge.

6.1.12. "Lock" the chamber lid.

6.1.13. "Pump" the chamber down. It should eventually go below 5 mT. If it does not, please make sure the purge is "OFF".

6.2. Process Sample

6.2.1. Still under the “Process” page, select a recipe “Name”.

6.2.2. Press “Download” and wait for a “Downloading was successful” message.

6.2.3. Press “Start Process”.

6.2.4. A window will open displaying the historical data filename. Do Not change the filename. Press the “OK” button.

6.2.5. Select Start

6.2.6. A graph will appear showing process conditions, such as temperature, gas, or pressure. Monitor the conditions to make sure the tool is operating correctly. Do Not “Skip” any steps.

6.2.7. A “Finished” message will be displayed when the recipe has completed.

6.2.8. Select “OK”.

6.3. Unload Sample

6.3.1. Ensure that the “Process” page is selected.

6.3.2. Select “Purge until ATM”. The Pirani-Cap value will increase to approximately 760Torr.

6.3.3. Select “Purge” to keep continuous N2 purge.

6.3.4. Select “Unlock”. The unlock sequence only works if the chamber is at atmosphere. Listen for the sound of the unlock solenoid.

6.3.5. Carefully open the chamber up by the handle. Lift it until it goes all the way up.

6.3.6. Ensure that the susceptor’s temperature is low enough to be handled safely using the supplied PEEK tweezers.

6.3.7. Remove susceptor lid and place it on the landing pad. Again, using the supplied tweezers.

6.3.8. Remove the sample(s) on the susceptor.

6.3.9. Replace the susceptor lid. (use the tweezers provide)

6.3.10. Carefully close chamber lid, using the handle.

6.4. Shutdown

6.4.1. Turn “OFF” the purge.

6.4.2. “Lock” the chamber lid.

6.4.3. “Pump” the chamber down. It should eventually go below 5 mT. If it does not, please make sure the purge is “OFF”.

6.4.4. Press the “Shut Down” button.

7. Process Data

7.1. New User Recipe List

Name	Operation	Operation
Idle	Type	Details
1	pumping	Start
2	condition	Wait for 30 seconds
3	pumping	Stop
R-finish		
1	RTP Temp	Power control to 0%
2	Condition	Wait for Pyro1 < 200 °C
R-preheat		
1	RTP Temp	Power control 10% and Pyro1 > 250 °C
2	RTP Temp	Pyro 1 control to 300 °C with ramp of 2 °C/s
3	Condition	Wait for 1 second
R-pump		
1	Purge	OFF
2	Pump	Start
3	condition	Wait for 30 seconds
4	condition	Wait for Pirani-CapMan < 0.005 Torr
5	pumping	Stop
R-purgeXX	XX designates the gas species: Ar, N2H2, N2, or O2	
1	pumping	Stop
2	gas	XX set point to 1000 sccm, ramp 5s
3	condition	Wait for atmosphere
4	gas	XX set point to 200 sccm, ramp 5s
5	condition	Wait for 10 seconds
template XX SUS	XX designates the gas species: Ar N2H2 N2 O2	
1	R-pump	Macro
2	R-purgeXX	Macro
3	R-preheat	Macro
4	RTP Temp	Select temperature
5	condition	Select time
6	R-finish	Macro

Revision History

Effective Date	Originator	DESCRIPTION OF REVISION	Issue
6/21/17	Todd Eller	Initial Release	A
6/21/19	Kevin Hilgers	Minor edits to include restricted material usage.	B
1/25/22	Kevin Hilgers	Procedural changes.	C
			D
			E
			F
			G
			H