










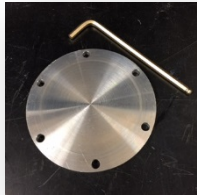



Sample Change: Orange Cryostat



Potential Hazards while performing these activities	
 Heat Hazard	A heat gun may be used. This could cause burns if used improperly.
 Electrical Hazard	This equipment contains liquid condensate near electrical connections.
 Pinch Hazard	Connecting items could present a pinch hazard. Use caution when making connections and tightening clamps.
 Cryogen Hazard	This process involves the use of cryogenics. Use caution and appropriate PPE.
 Radiation Hazard	This process involves removing activated samples from the cryostat.
 Pressure Hazard	This process involves pressurizing the cryostat. Use caution and follow provided instructions.
 Caution	There are many wires and cables involved in a sample change. Use caution when working to avoid unplugging or damaging them.

Preventions to reduce exposure to hazards:	
 Eye Protection	Safety glasses must be worn while performing these steps.
 Protective Gloves	Safety gloves will be required for some of these steps.
 Read Manual/Guide	Become familiar with this guide before operating.
Caution	Follow the appropriate and applicable sample handling procedures for Safety and Radiological Control
Note	If at any point you experience a problem while performing these steps, immediately contact the sample environment team lead for further assistance.

Steps	Pictures		
1. Collect all the necessary PPE, tools, and equipment: Safety glasses, gloves, Allen key, sample space blank, rough pump, vacuum pumping line, helium gas cylinder with regulator.			
2. Put on the appropriate safety glasses.			

3. Warm the VTI and sample temperatures to a minimum of 100 Kelvin by heating on the VTI. Do not proceed until both temperatures are at 100 K.



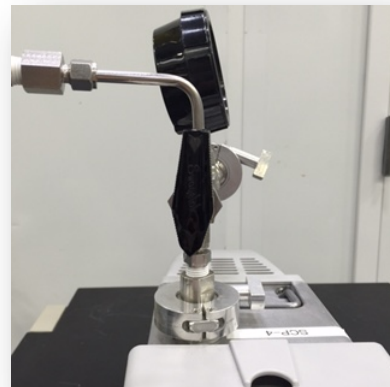
4. Connect the vacuum pump and vacuum pumping line to sample space pumping port labeled V-6.



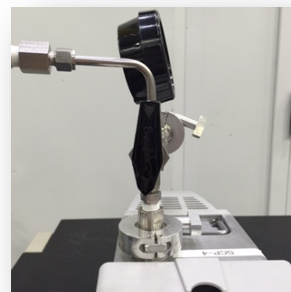
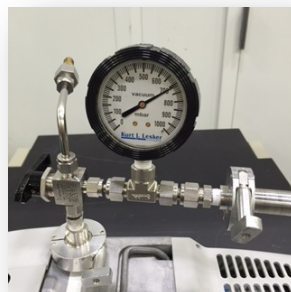
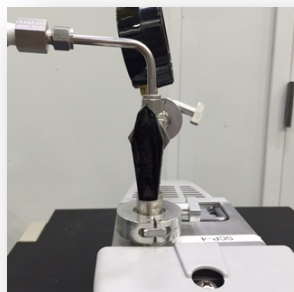
5. **Important:** Ensure the helium gas cylinder is open and has no less than 200 psi. This will ensure you have enough gas to complete the following steps. Set the regulator on the helium gas cylinder to a pressure of 1-2 psi, and connect the helium gas cylinder with regulator to the vacuum pump.



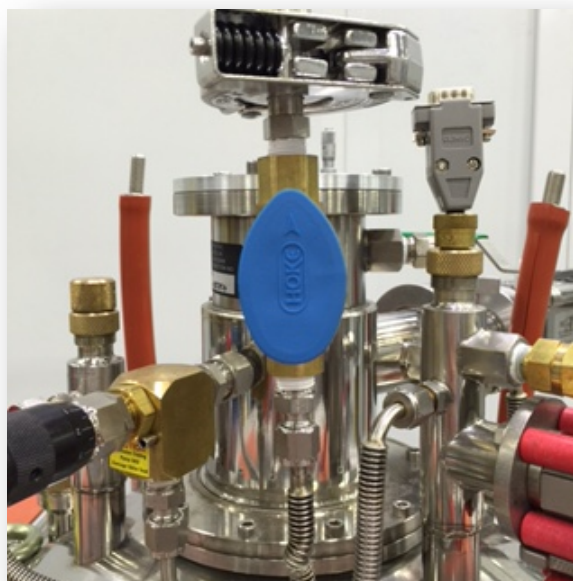
6. Power on the vacuum pump, and begin pumping on the vacuum pumping line by turning the black 3-way valve on the vacuum pump to the down position.



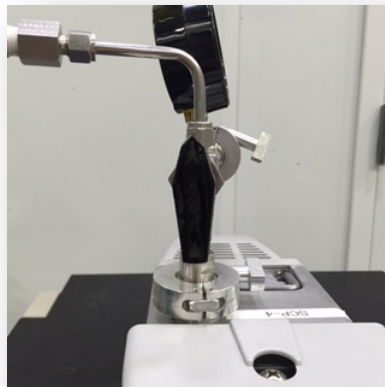
7. Vent the vacuum pumping line with helium gas by turning the black 3-way valve to the up position. When the gauge on the pump indicates a pressure of 1000 mbar, begin pumping on the vacuum pumping line by turning the black 3-way valve to the down position. Repeat this step 2 times.



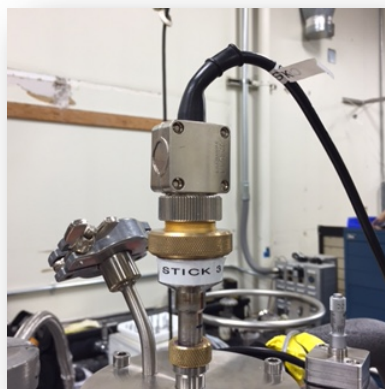
8. With the vacuum pumping line under vacuum, indicated by a pressure of zero on the vacuum gauge, and the black 3-way valve in the down position, open V-6 by turning the blue 3-way valve to the up position. You are now pumping on the sample space.



9. Vent the sample space with helium gas by turning the black 3-way valve on the vacuum pump to the up position. Wait for the vacuum gauge to read 1000 mbar.

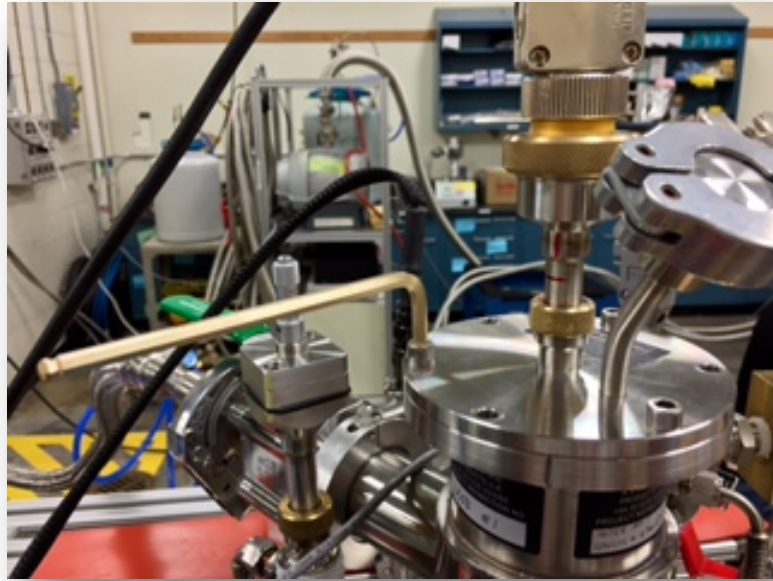


10. Disconnect the sample stick sensor cable from the sample stick.
Important: Be careful not to loosen the brass sample stick sensor connector while removing the sensor cable.



11. Loosen screws (or clamp) from sample stick flange (or flange blank), but **DO NOT** remove completely. If the sample stick (or flange blank) move freely, the space is full of helium gas, has vented off excess pressure, and it is safe to remove screws (or clamp).

Important: *If the sample stick (or flange blank) does not rotate easily, re-tighten the screws (or clamp) and contact the sample environment team lead for further assistance.*



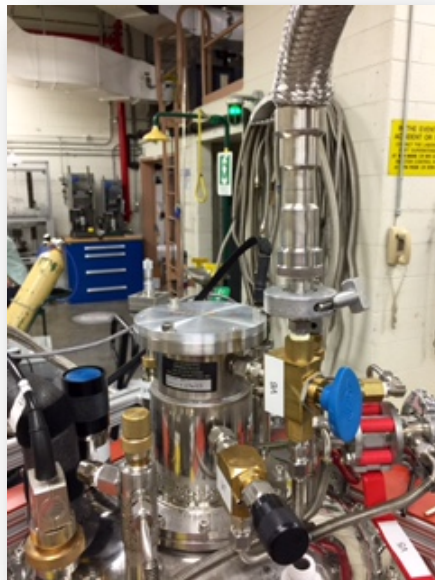
12. Put on protective gloves, and carefully remove the sample stick from the cryostat.



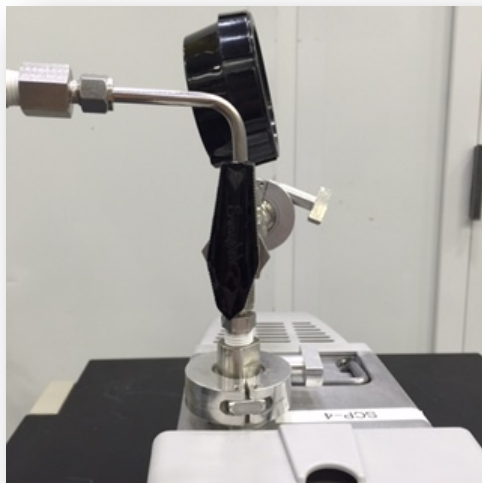
13. Follow the appropriate and applicable sample handling procedures for Safety and Radiological Control.



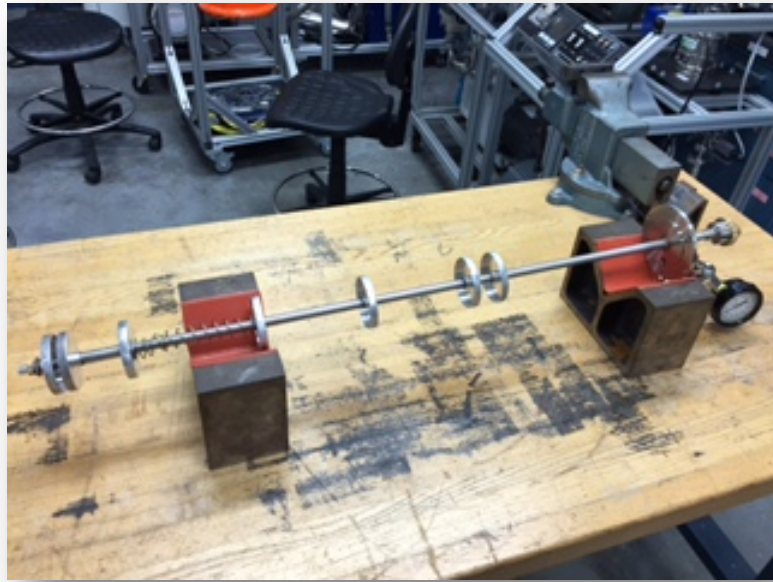
14. Ensure O-ring is clean and in place. Place flange blank on sample space and tighten screws (or clamp).



15. Begin pumping on the sample space by turning the black 3-way valve on the vacuum pump to the down position.



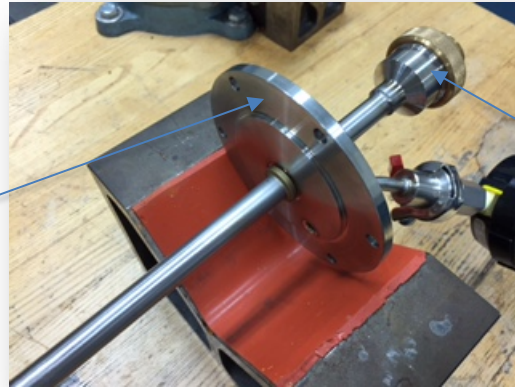
16. Carefully install the new sample on the stick.



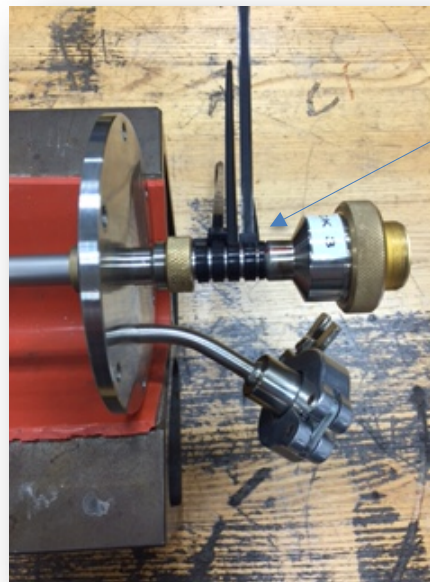
17. Ensure the following:

- a. Sample is at the correct height for the beam.
- b. The bottom of the sample does not exceed the overall length of the sample well.
- c. If there is a mark, bring the mark out to a fixed point on the top of the sample stick.
- d. Secure sample stick by using tie-wraps.
- e. The sample stick **MUST BE DRY** prior to re-installing in the cryostat.

Beam height measuring surface



Place mark on fixed point



Important:
Ensure there is a minimum 1 inch of tie-wrapped section to allow the sample stick to properly seat into the cryostat without interruption.

18. Plug the sample stick sensor cable in to the stick, prior to inserting into the cryostat, verifying the sensor is reading properly. Once you have verified the sensor is reading (room temp), unplug sample stick sensor cable from sample stick.

19. Repeat **STEP 8.**

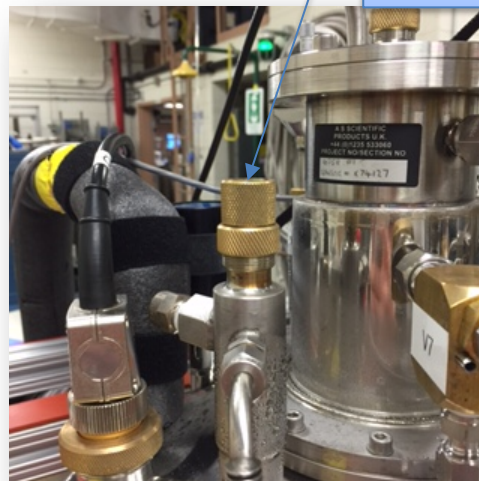
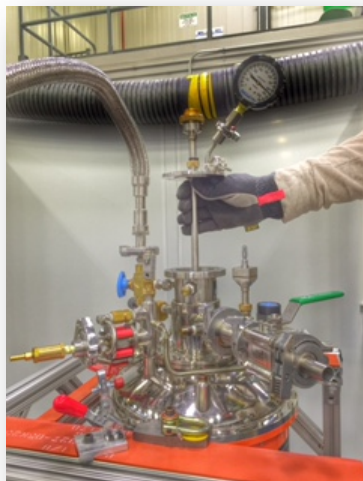
20. Repeat **STEP 10.**

21. Remove the flange blank. Ensure O-ring is clean and in place prior to installing the sample stick.



22. Carefully and slowly, install the sample stick into the cryostat. Ensure the following:

- a. No part of the sample stick is obstructing the space above the liquid helium fill port.
- b. The orientation mark is located in the desired position.



23. Install and tighten screws (or clamp).

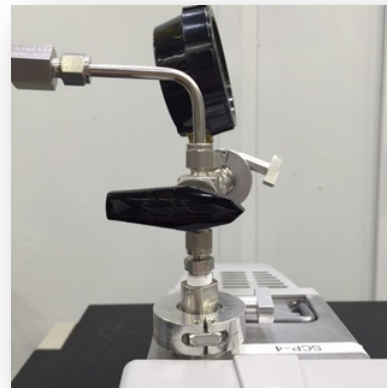
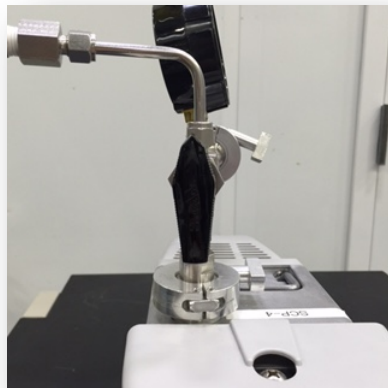
24. Connect the sample stick sensor cable to the sample stick.



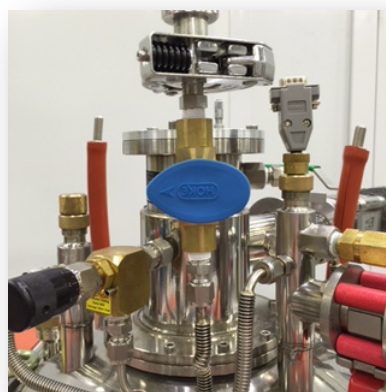
25. Repeat **STEP 13.**

26. Repeat **STEP 6.**

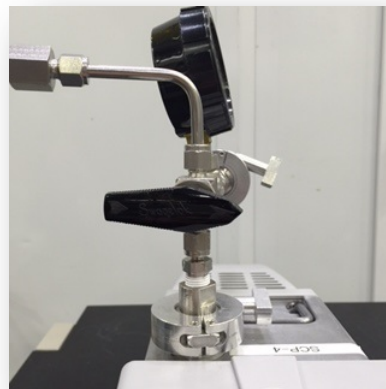
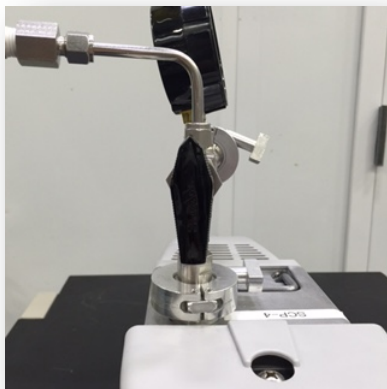
27. With the vacuum pumping line under vacuum, indicated by a pressure of zero on the vacuum gauge, and the black 3-way valve in the down position, slowly turn the black 3-way valve towards the up position, watching the vacuum gauge. When the vacuum gauge indicates a pressure of 100-250 mbar (final exchange gas pressure), close the black 3-way valve by turning to the horizontal position.



28. Immediately close the blue 3-way valve on the sample space by turning to the horizontal position.



29. Vent the vacuum pumping line by turning the black 3-way valve to the up position until the vacuum gauge reads 1000 mbar. Once the line is vented, close the black 3-way valve by turning to the horizontal position.



30. It is now safe to power off the vacuum pump. Remove the vacuum pumping line and helium gas cylinder. Ensure the helium gas cylinder regulator isolation valve is in the closed position.



31. Return the PPE, tools, and equipment to their appropriate locations.