**Vacuum Distillation Instructions**
**(for purification of nopinone on an ca. 5 g scale)**

1. Transfer your sample, which you have carefully checked in advance to ensure that it does not contain peroxides, to a tared 2550 mL round-bottom flask with a 14/20 standard taper neck.
2. Remove all excess hexanes, the extraction and transfer solvent, on a rotary evaporator. This is an important step because residual solvent will often 'bump' during distillation, which will negatively impact the efficiency of the purification.
3. Measure the crude mass of your sample at this point.
4. Add a magnetic stirring bar to the flask; the largest bar that readily will fit into the neck of the flask is desirable because efficient agitation will help ensure a smooth distillation.
5. The vacuum distillation apparatus is stationed in the east hood. Ensure that the cold (Dewar) trap is charged with dry ice in acetone. Because we will now be using a water aspirator rather than a vacuum pump, the cold trap is not necessary.
6. Apply a light layer of silicone vacuum grease to the top half of all male joints on the all-in-one short path distillation head. (link to photo)
7. Attach the 2550 mL flask, the distillation "pot," to the distillation head with a yellow Keck clamp and clamp the neck of the flask with the three fingermetal clam-shell clamp that is situated above the silicone oil heating bath. This bath sits atop a magnetic stirrer. Do not add additional clamps to the setup. Lightly grease the top portion of the ground-glass joint on the standard taper (10/30) thermometer and insert it into the distillation head.
8. Tare three 10-25 mL round-bottom flasks (14/20 necks) as potential receiving flasks.
9. Attach one of the three collection 25 mL round bottom flasks to the short path setup with the aid of a yellow Keck clamp (Google search for images; color-coded for joint size). Gently rotate all greased joints to ensure the grease is evenly spread to provide a good vacuum seal.
10. Turn on a **gentle** flow of cooling water through the condenser – check the end of the line that is emptying into the cup sink to ensure that the flow is steady but gentle.
11. If it is not already attached, connect the vacuum hose to the vacuum sidearm on the distillation head.
12. Check your setup with the TA.
13. Close the vertical sash and the horizontal shields built into the hood so they are in front of the setup.
14. Turn on the magnetic stirrer to a gentle speed (100 rpm) and turn on the vacuum pumpaspirator to **full** flow to reduce the system pressure.
15. If excessive bubbling and/or bumping is observed, then turn off the vacuum pump, vent the system, and remove additional residual solvent on the rotary evaporator. (Check with a TA if your solvent bumped into the distillation head.)

16. Reassemble your apparatus and proceed.
17. Once all bubbling and/or bumping has subsided, use the lab jack underneath the stirrer heating plate to raise the bath and immerse the distillation pot. If the oil bath is already hot, raise it very slowly to immerse only the bottom portion of the pot. The rate of heat transfer from the bath to the pot and its contents will depend on the depth of immersion. Slowly raise the jack and bath as warranted by whether or not you observe overly vigorous bubbling and boil-off of any residual volatile components (e.g., solvent) in your sample.
18. Submerge the flask as deeply as your clamp (and the ~~magnetic stirrer~~large paper clip in the oil bath) will permit.
19. Turn on the heat plate and adjust it to a set ~~n appropriate~~ temperature ~~(*ca. 70–80 °C*, because we are using the vacuum pump, which will pull a vacuum of < 1 mmHg). Note: we **may** be changing the vacuum source later this Fall, which will lead to changing the guidance on temperatures and pressures; stay tuned.~~ of 135 °C.
20. Watch for droplet formation in the condensing arm of the head.
21. Once the first one to several droplets are collected in the receiving flask, remove the apparatus from the heat source (by carefully lowering the lab jack supporting the oil bath), use the T-stopcock to vent the apparatus to atmospheric pressure (while leaving the vacuum ~~pump~~ source isolated and under vacuum), replace the receiving flask with a second tared flask, reduce the pressure once more (stopcock change), and *then* reapply heat by slowly re-immersing the distillation pot into the oil bath (by carefully raising the lab jack). The first flask, which you just replaced, contains what is called the forerun.
22. The liquid that begins to distill next should be your purified product; continue to apply heat and distill ~~all~~ most of the contents of the pot into the receiver. You will likely find that the temperature of the internal thermometer (which measures the vapor in the top portion of the distillation head and which you should record as the boiling point range) will tyically be 20-30 °C lower than that of the external oil bath. Record the temperature range of the internal thermometer while droplets are being collected. You can coax the last half mL or so of pot content over to the receiving flask by warming the glass joint between the pot and distillation head with a heat gun. Don't make it so hot that you melt the Keck clamp and don't point the gun downward into the oil bath, because that will spray hot oil.
23. Terminate the distillation just as you did when you changed the receiver flask by venting the distillation head to atmospheric pressure. Record the mass of the distillate – your purified product.
24. Clean the outside of your distillation pot with a paper towel and hexanes to remove the silicone bath oil and remove the residue inside the pot flask with acetone (and into a beaker, destined for organic waste) before further washing it with soap and water.

25. Rinse all surfaces of the short path distillation head, inside and out, with acetone, carefully catching the washing in a beaker for discarding into the waste container, to ready it for the next user.
26. Be careful not to contaminate the silicone oil in the heating bath with any of the acetone wash solvent (or any other organic contaminants).

last edited by Rong Tang and TRH September 3024, 2024