Connor Bailey and Victoria Chen Quick Guide to Aligned Transfer of 2D Materials in ExFab Glovebox



An overview image of the right glovebox in ExFab

- Refill the load lock (LL) with N₂ and load samples. Close the LL and evacuate, ensuring the decrease of the LL pressure. Refill again (without opening) and evacuate again. Repeat this process 10x to ensure that as much oxygen is purged as possible. Never open both the evacuation and refill valve at the same time. In other words, cycle through: Open evac. valve→ wait to pump down→ close evac. valve→ open refill valve→ wait for pressure to rise→ close refill valve→ open evac. valve. (Repeat).
- 2. With the LL refilled and both valves closed, open the LL from the inside of the glovebox and take samples in. Close the LL and keep it evacuated.
- 3. Mount the glass slide/PDMS/2D material onto the micromanipulator with the desired material facing down (towards the stage). If working with a very air sensitive sample, this slide/PDMS/2DM stack will have to be prepared in the glovebox (cut your PDMS to desired size before loading).







- 4. Place the target substrate onto the stage under the microscope.
- 5. Turn on the microscope light. The view will be displayed on the monitor on the table to the right of the glovebox.
- 6. Adjust the stage and micromanipulator in the x-y plane until the material is over the target substrate in the desired place.
- 7. Carefully lower the micromanipulator arm until the stamp is in contact with the target substrate.
- 8. Turn on heat if desired. Heater controls are located underneath the glovebox, and will heat the microscope stage if turned on. A typical value may be 130°-150°C, and will depend on your target substrate and PDMS. A typical time to heat is 10 minutes, but will vary on your conditions.
- 9. After heating, the PDMS should easily release and the stamp can be raised from the substrate, leaving behind the desired material onto the target substrate.
- 10. Unload the sample though the LL, making sure that the inside of the glovebox is never exposed to ambient. Always leave the LL evacuated.

Additional notes:

- Retracting your arms from the gloves while the stamp is down will cause a pressure differential which will lead to vibrations in the glovebox that can hurt the transfer.
- Keep an eye on the oxygen and trace moisture levels in the glovebox. They are typically measured in ppm but at very high levels will be measured in %.
 - The glovebox can be purged by opening the N_2 valve located on top.
 - If they remain at high levels for too long, samples inside the glovebox may degrade and a regen may be necessary.
- Solvents must be loaded in the solvent transfer container (with a pinhole on the lid).
 - If solvents are used in the glovebox, make sure to close the inlet and outlet valves in the back of the glovebox to prevent catalyst damage.
- Always clean up when you are done using the glovebox, and do not heat materials on the stage that could melt.





