

Wafab Electroplating Bench

Standard Operating Procedure

Revision: 1.0 — Last Updated: Jul.6/2012, Revised by Nathanael Sieb

Overview

This document will provide a detailed operation procedure of the Wafab Electroplating Bench. Formal Training is required for all users prior to using the system.

Revision History

#	Revised by:	Date	Modification
1	Nathanael Sieb	07/06/12	Initial release
2			
3			
4			
5			

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General Information

The Wafab Electroplating bench is used for electroplating various metals onto conductive substrates. The tool has 4 heated and recirculating baths for 4 different metals and a quick-dump-rinser for rinsing. The 2 power supplies can be directed to any of the baths and are designed for different current ranges. Up to two users can utilize the bench concurrently.



Operation

1. System startup

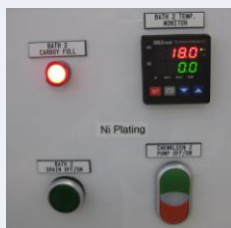
- Create a new ticket at nanofabrication.4dlabs.ca for Wet Lab and Electroplating bench usage.
- Upon entering the Wet Lab (room 6074), switch the exhaust fan speed to high.



- Put on all Personal Protective Equipment (PPE), including a lab coat, goggles, and gloves.
- Turn on the main power of the electroplating bench.
- Turn on the associated heater/chiller and enter the desired temperature setpoint.



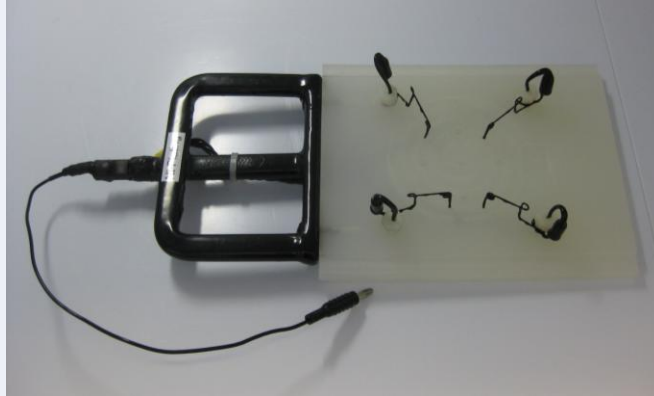
- When the temperature in the bath is **greater** than 40 °C, then turn on the recirculating pump.
 Note: The Carboy Full light is usually on during operation.



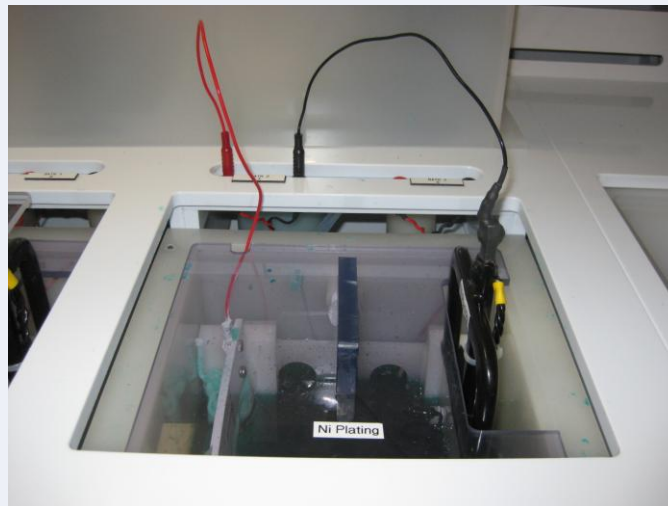
- Visually confirm that the solution is agitating.

2. Sample loading

- The sample that will be electroplated must have a conductive base layer.
- Place the sample on the cathode carrier under the electrical contacts.



- Ensure that the electrical contacts are touching the conductive base layer.
- Remove the lid on the electroplating bath and place the cathode carrier into the bath.
- Connect the anode and cathode cables to the outlet for the appropriate power supply and put the lid on the bath.



3. Process settings

- Select the power supply appropriate for your desired current: the maximum average current for power supply A is 0.1 A and for power supply B is 3 A.



- Enter the following parameters for DC or pulsed deposition:
 - Forward on time
 - Forward off time
 - Forward cycle time
 - Reverse times (should be zero)
 - Forward peak current
 - Real time cycle

Table 1: Suggested process recipes for electroplating

Metal	Temperature	Mode	Forward on time	Forward off time	Forward cycle time	Current density	Deposition Rate
Nickel	53 °C	Continuous	100 ms	0 ms	1 s	1 ASD	~200 nm/min
Nickel	53 °C	Pulsed	1 ms	3 ms	1 s	1 ASD	~50 nm/min
Gold	60 °C	Continuous	100 ms	0 ms	1 s	0.2 ASD	~160 nm/min

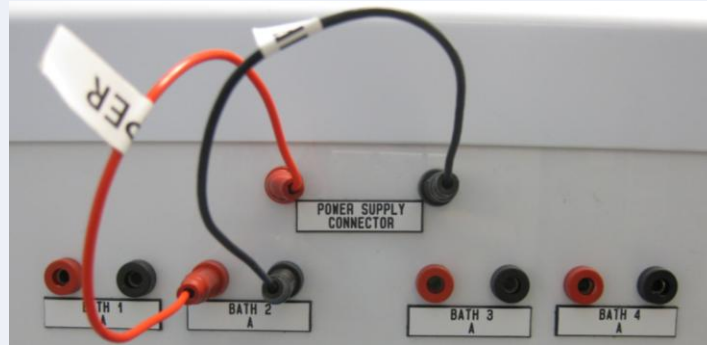
Notes:

The forward peak currents must be calculated based on the plating area. For example, if you want to plate a 30 mm x 40 mm area:

$$\text{Area} = 30 \times 40 = 1200 \text{ mm}^2 = 0.12 \text{ dm}^2$$

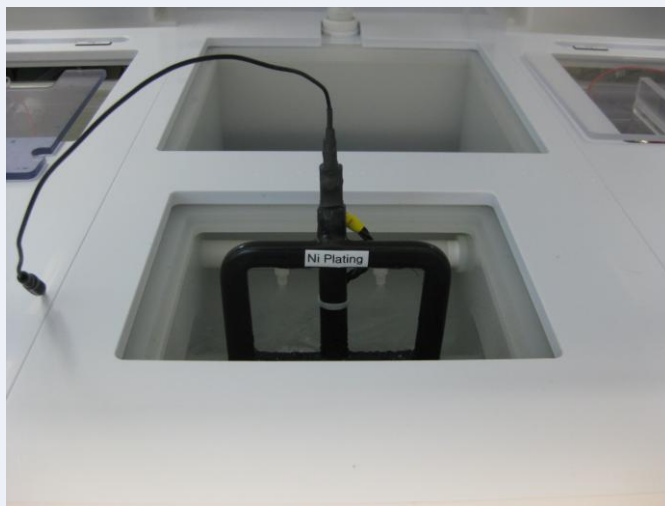
$$\text{Deposition Current} = 1 \text{ ASD} * 0.12 \text{ dm}^2 = 0.12 \text{ A} = 120 \text{ mA}$$

- Pulsed depositions take longer, but typically produce smaller grain sizes.
- Finally, connect the jumpers above the power supply to send the power to the appropriate bath.



4. Electroplating

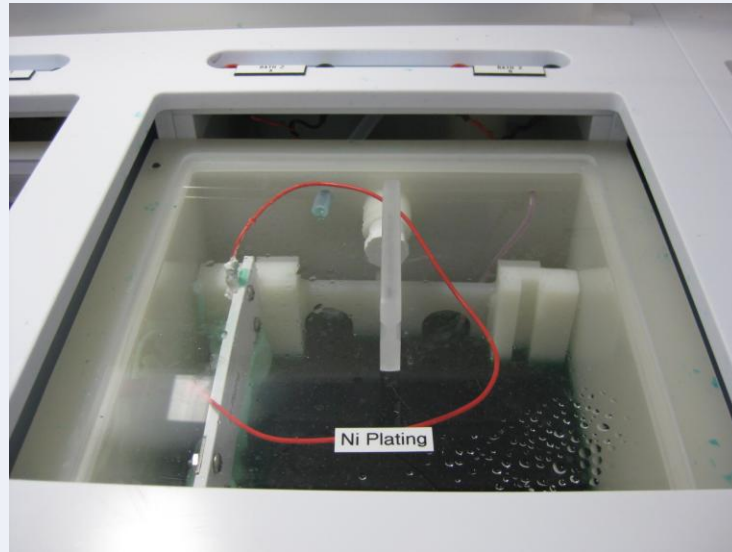
- Press OPR on the power supply to begin plating.
- Ensure that the correct current is displayed on the output.
- The voltage will slowly drop through the deposition while the current remains constant.
- When the deposition is complete, remove the cathode carrier and put in the Quick-Dump-Rinser.
- Press start on the QDR



- When the cycle is complete, remove the sample and dry with N2

5. System shutdown

- Disconnect the anode and cathode and place the full lid on the tank to prevent evaporation of the bath.



- Turn off the recirculating pump.
- Turn off the heater chiller.
- When the bath temperature is **less** than 30 °C, then turn off the electroplating bench. Press silence to stop the alarm.
- **ONLY IF** no one else is using the Wet Lab, then turn the exhaust to the low setting.
- Complete your usage ticket at nanofabrication.4dlabs.ca.

References and Files

Wafab Electroplating Bench Manual and training notes.

Contact Information

Questions or comments in regard to this document should be directed towards Nathanael Sieb (sieb@4dlabs.ca) in 4D LABS at Simon Fraser University, Burnaby, BC, Canada.