

# **LAB 2**

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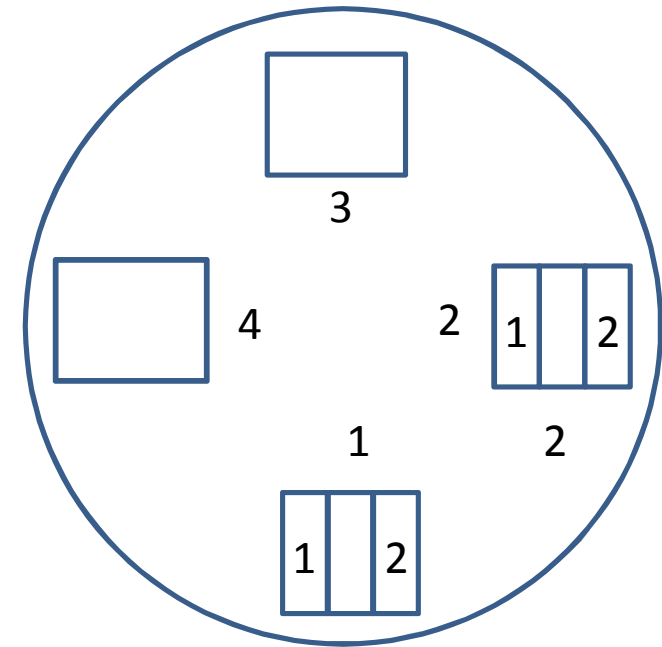
## **Metal and organic thin films deposition and characterization**

Deposit below thin films using thermal evaporation. Record the process parameter such as base vacuum, temperature, deposition rate and etc.

1. Ag 100 nm (sample position 1-1)
2. Alq 100 nm (sample position 1-2)
3. Ag 100 nm/Alq 100 nm/Ag 20 nm (sample position 3)
4. Ag 100 nm/Alq 150 nm/Ag 20 nm (sample position 4)
5. Ag 20 nm (sample position 2-1)
6. Ag 20 nm/Alq 40 nm (sample position 2-2)

Deposition sequence:

1. Ag 100 nm, open mask for sample position 1-1, 3, 4
2. Alq 100 nm, open mask for sample position 1-2, 3, 4
3. Alq 50 nm, open mask for sample position 4
4. Ag 20 nm, open mask for sample position 2-1, 3, 4
5. Ag 20 nm, open mask for sample position 2-2
6. Alq 40 nm, open mask for sample position 2-2



- Configuration and principles of the deposition equipment (vacuum system, vacuum measurement, thermal source, in-situ thickness measurement and etc.). Describe how to deposit the thin films.
- Experimental set-up of the optical/electrical measurement. Describe how to measure the sheet resistance and reflectance, transmission of thin films.
- Discuss how to measure the deposition rate and thickness. Discuss the principle of thin film thickness measurement.
- Measure the distance between the thermal source and the substrate. Calculate the deposition uniformity of the equipment.
- Measure the sheet resistance of sample 1, 5. Calculate the thickness and the uniformity from the measurement results. Does the sheet resistance linearly scale with the thickness of the film? Does the film uniformity agree well with the deposition uniformity of the equipment?
- Observe the optical appearance of sample 3, 4. What color do they appear? Take a photo of the sample. Observe the optical appearance of sample 5, 6. Which sample is more transparent? Take a photo of the sample.
- Measure the reflectance of sample 2-4. Discuss their difference. Extract the thickness of Alq from the measured results. Discuss the measurement mechanisms.
- Measure the reflectance and the transmission of sample 5-6. Discuss their difference and the reasons. For sample 6, what is the function of Alq capping layer?
- Measure the thickness of sample 1, 2, 5 using Stylus profiler. Compare the thickness values measured by different techniques, i.e., Stylus profiler, in-situ quartz microbalance, optical and electrical extraction, and discuss the difference.

Format of lab report (you may use the IEEE EDL paper format):

0. Title, author, author affiliation, abstract, keywords
1. **Briefly introducing the lab.** (e.g., purpose of the lab; working principle of the devices; literature review; and etc...)
2. **Experimental details.** (experimental set-up; configuration and mechanism of the equipments; detail of the fabrication and the characterization; and etc...)
3. **Results and discussion.** (analyze the experimental data; answer the questions set by the instructor)
4. **Conclusion.**
5. Acknowledgements.
6. References.

**3 pages limited!**