EE 491 Weekly Report

Week 8: 10/14-10/20

Group: *May14-03* **Advisors:** *Dr. Sumit Chaudhary, John Carr* **Client:** *ISU NanoLab*

Members: *Andersen, Martin; Diallo, Mouhamadou; Rodriguez, Nicholas; Straquadine, Joshua (Leader)*

Project Title: *"Design and implementation of cryogenic current measurements on organic photovoltaic cells"*

Weekly Summary

This week we ran some more tests of our thermal pads, cold trap, and

Meetings

10/16 Advisor Meeting

Duration: *1 hour* **Members Present:** *All*

Purpose and Goals:
Go over our project plan with our advisors, discuss our progress up to this point and plan out our next steps

Achievements:

- We found that we were still on the right track. We discussed what materials we had available and what we may need to purchase in the near future. We also talked about meeting with some other researchers in the physics department who might have some information on how to improve our cryostat system.

10/17 Lab Meeting

Duration: *2 hours* **Members Present:** *Joshua, Martin, and Mouhamadou*

Purpose and Goals:
Begin testing the thermal pads in the cryostat chamber and determine feasibility.

Achievements:

- We only had time to test one of the pads, but we forgot to take off the liner material. We also didn't use enough grease, so our RTD ended up coming off of the surface. With both of these issues combined, we couldn't determine if the data was trustworthy or not.
- Through that experience, we learned how to make our tests more reliable

10/20 Lab Meeting

Duration: 6 *hour* **Members Present:** *All*

Purpose and Goals:
Redo the tests from Thursday with better procedures, and test all three of our thermal pad options. We also wanted to run a quick test with the cold trap we had designed.

Achievements:

- Completed tests of all three thermal pads, but all of them froze out and lost their thermal conductivity below 200 K. At that point, the temperature of the sample stopped matching that of the cryostat head, and we never managed to get the sample below 175 K.
- Ran a test with the cold trap and vacuum grease, with much success. The cryostat quickly and easily reached 78 K, even with less than maximum power on the cryo vacuum, and the sample reached 90 K in about 30 minutes.
- Determined that the grease may not be able to handle the thermal annealing process, so we are still in need of a new thermal interface material.

Pending issues

We were all very disappointed by the failure of our thermal pads. We had contacted all the companies we knew of, and these seemed like the best on the market. We're not sure if a suitable pad will even be commercially available, but we'll keep looking. We still haven't tried the thermal epoxy we ordered, but we will need a scale to measure out weights, some wet-lab space, and a method of extending sample contacts in order to run those tests.

Plans for next week

Despite the failure of our thermal pads, the cold trap was a definite success. We would like to focus for the time being on the cold trap and other insulation within the cryo chamber. We also would like to run some tests with the epoxy, though that will most likely be a multi-week process because of the overnight cure times.

Individual Contributions

- Andersen, Martin: Attended meetings, worked with thermal pads and cold trap (9 hr)
- Diallo, Mouhamadou: Attended the meetings, experimented with new thermal pads and cold trap (9 hr)
- Rodriguez, Nicholas: Attended meetings, experimented with thermal pads, and cold trap (7 hr)
- Straquadine, Joshua (Leader): Attended meetings, worked on thermal simulations, experimented with thermal pads and cold trap (11 hr)