EE/CprE/SE 491 WEEKLY REPORT 5 - sdmay18-24

10/01/17 – 10/07/17

Project title: Optical force transducer for visualizing cell mechanotransduction in 3D

Client: LIOS Lab
Advisor: **Prof Meng Lu**

Team Members/Role:
Quan Wang --- fabrication and process development
Yalun Tang --- fabrication and process development
Jiameng Li --- theory and numerical modeling
Qinming Zhang --- theory and numerical modeling

o **Past week accomplishments**

- Yalun Tang:

1. Attached the gold nanoparticles on the surface of the bare optical fiber.
2. Learned how to use laser.
3. Learned how to use the microscope.
4. Designed a new process to conduct surface chemistry
    a. Smaller container(15mL)
    b. new fiber holder that hang up the fiber, so only the tip of the optical fiber is dipped into the chemical solutions

- Quan Wang:

1. Finished the 1st trial of surface chemistry, the gold nanoparticles attached
2. Learned how to install FC connector, and use microscope to observe the fiber
3. Read relevant published paper to find out better solution for next stages of experiment
    a. Material for the core of the Single mode fiber
    b. Why the optical fiber is fragile after attaching the gold nanoparticles
4. Designed a new process to conduct surface chemistry to save time and chemical solutions

- Jiameng Li:

1. Finish designing model with 2D version

2. Trying to add mental balls in different locations nearby the fiber, and we run it to see the waving changes. In this case, the location of ball can affect the result of waving, so by comparing wavings, we want to choose the best location of balls.

- Qinming Zhang:

1. Set up the trestle table.
2. Learned some basic technique about prepare and clean fiber.
3. Read some relevant paper about the design of the project

- Group:

1. Learned how to install the FC connector, found a manual for FC connector installation
2. Finished attaching gold nanoparticles, the first trail of surface chemistry was completed
3. The basic numerical model for optical force transducer is done, need to put more nanoparticles on top of the fiber
4. Started to design the cube holder for the fiber in surface chemistry
5. Finished the 2D model of optical force transducer

o **Pending issues**

1. The optical fiber become fragile after attaching the gold nanoparticles, it is very hard to handle the fiber without damaging it
    a. The fiber tip break into four parts as it was dipped into ionized water, only 0.5mm remained on the fiber
2. The FC connectors we bought cannot be installed because the size/dimension was incorrect, need to buy the correct version of single mode optical fiber of FC connectors
3. The amount of GA and PVA solutions used for surface chemistry is small, we need to design a new process or find a new container to save the solutions

o **Individual contributions**

Team member	Contribution	Weekly hours	Total hours

Yalun Tang	Attached the gold nanoparticles, design new techniques of surface chemistry	4	29
Quan Wang	Finished the first trail of surface chemistry	4	29
Jiameng Li	Finished the fiber part of simulation	4	29
Qinming Zhang	Set up the trestle table	4	29

o **Plan for coming week**

- Yalun Tang and Quan Wang(fabrication):

1. Prepare a new set of samples to do surface chemistry(single and multiple mode optical fiber)
    a. Observe both of the single mode and multiple mode optical fiber
2. Install the FC connector with a 1 meter single mode optical fiber
3. Start 3D numerical model

- Jiameng Li and Qinming Zhang(simulation and modeling):

1. In the next step, we will change 2D version into 3D version, and the shape of mental ball will be sphere rather than a circle, this can be more accurate than the previous one. Therefore, waving result will be more precise.

O **Summary of weekly advisor meeting**

In the meeting, we discussed the possible solutions to save the fragile fiber tip, and discussed the inner material of the single mode optical fiber. We cannot proceed if we cannot make an perfect fiber tip with gold nanoparticles attached. At the same time, we have completed the 2D version of the numerical model, the next step will be turning the 2D model into 3D model for better parameter. Professor Lu suggest us to read more relevant research papers to find out other researchers' fiber processing steps and the effect of gold nanoparticles on the fiber core.