## EE/CprE/SE 492 bi-WEEKLY REPORT 4 - sdmay18-24

# 02/26/18 - 03/09/18

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 weeks accomplishments

- Yalun Tang:
- 1. Found the time when all the cladding would be etched: 37 mins
- Quan Wang:
- 1. Finished finding the approximate time a fiber should be etched to reach the core
- 2. Finished a new set of surface chemistry and attached gold nanoparticles
  - a. New method of diluting the 60 nm gold nanoparticles solution
  - b. The fiber is now stable and not easy to break apart
- Jiameng Li:
- 1. Finish exploring scattering distribution at diameter of 6 micrometers and 8 micrometers.
- 2. Finish analysing light intensity of the optical fiber at 6 and 8 micrometers.
- 3. Adding gold nanoparticle around the fiber, figure shows the field distribution of scattering light.



Figure. With nanoparticle



Figure. Without nanoparticles

4. Compare with the line figure in the last report, the gold nanoparticle is truly effects scattering of light for optical fibers.

- Qinming Zhang:
- 1. Finished installing the fiber holder, and currently in the process of creating two more fiber holder
- 2. Finished analyzing the light intensity of optical fiber in the simulation
- Group:
- 1. Finished etching the fiber
- 2. Stabilized gold nanoparticles-attached-fiber by changing the solution
- 3. Finished simulation of gold nanoparticles attached fiber(6um and 8um)

## o Pending issues

- 1. Since the core of the optical fiber is made of pure silica, it would experience extremely high etching rate under 49% HF. All the core would be etched within 2 mins. According to the simulation result, we can get a strong field power when the diameter of the core can be etched to around 1 um. So we need to change to use lower concentration of HF (10%) after removing all of the cladding part to figure out the etching rate for core under 10% HF.
- 2. We used off the Epoxy for installing connectors.

# o Individual contributions

Team member	Contribution	Weekly hours	Total hours
Yalun Tang	Removed all of the cladding	20	50
Quan Wang	Etched the cladding layer of fiber, finished the surface chemistry experiment	20	50
Jiameng Li	Add gold nanoparticle nearby optical fiber	20	50
Qinming Zhang	Analyze simulation and install new fiber holder	20	50

## o Plan for coming week

- Yalun Tang and Quan Wang(fabrication):
- 1. To figure out the etching rate for core
- 2. To install a FC connector on a new single mode fiber, then stabilize another end of the fiber on the high density plastic etching platform to conduct etching and surface chemistry
- 3. To observe the light scattering by laser-fiber coupling under a microscope
- Jiameng Li and Qinming Zhang(simulation and modeling):
- 1. We will continue work on gold nanoparticles, , and we will try to set different locations around the optical fiber to see the difference of scattering light.
- 2. We also want to test the number of gold nanoparticles to the optical fiber.

# O Summary of weekly advisor meeting

In the meeting, we mainly talked about the plan for next half of the semester, and discussed the resolved issue of fiber experiment. The past two weeks are pretty productive as we finished finding the time of etching the cladding layer, and we can apply the results we found to continue our experiment. We will send our sample to SEM which can clearly observe the scattering of gold nanoparticles on our fiber sample.