

EE/CprE/SE 492 Bi-WEEKLY REPORT 2 - sdmay18-24

01/29/18 – 02/09/18

Project title: Optical Wash-free Transducer for Biomarkers analysis

Client: LIOS Lab

Advisor: Prof Meng Lu

Team Members/Role:

Quan Wang --- fabrication and process development

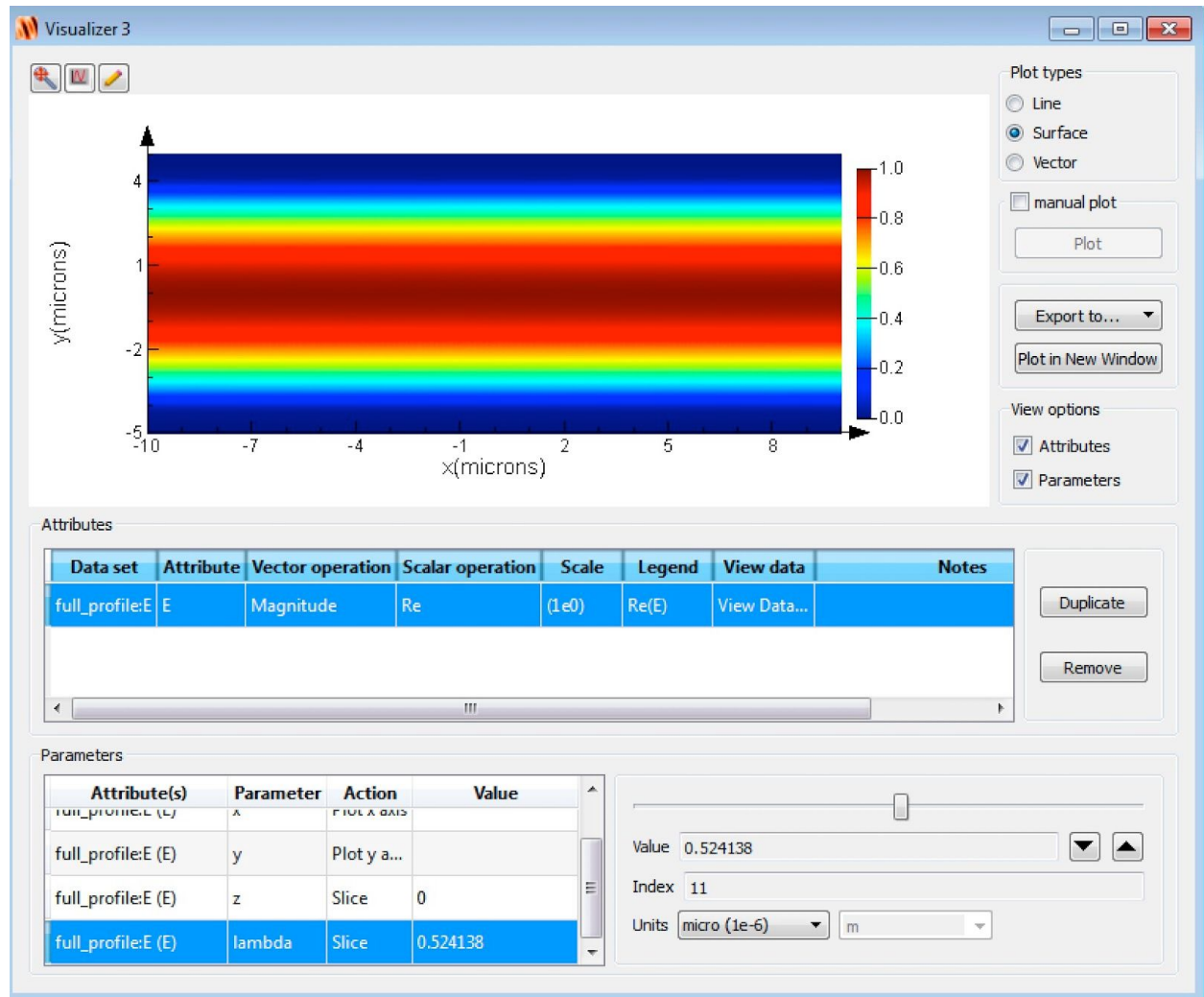
Yalun Tang --- fabrication and process development

Jiameng Li --- theory and numerical modeling

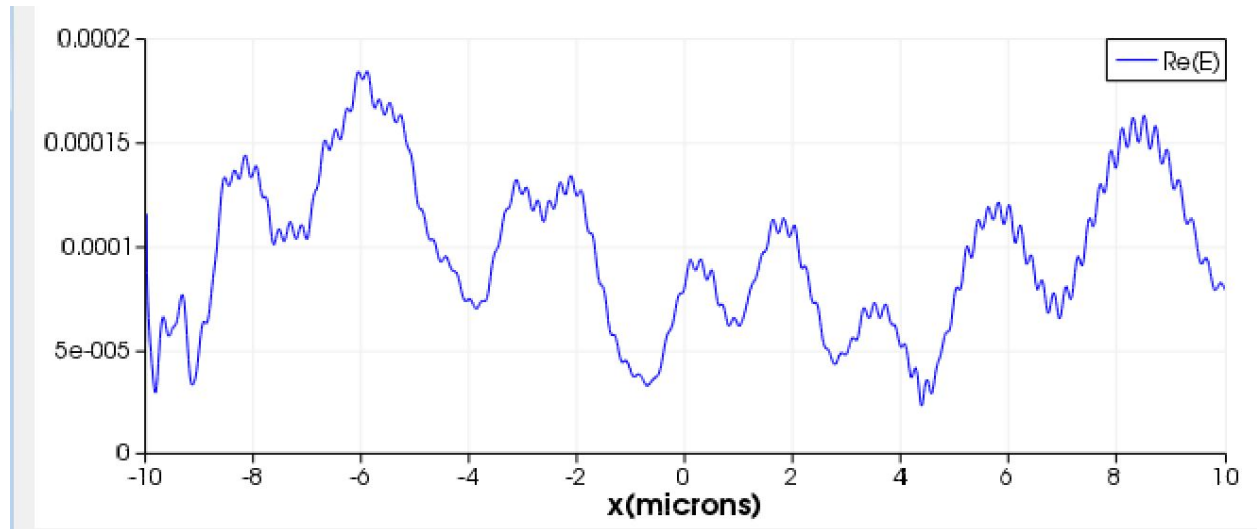
Qinming Zhang --- theory and numerical modeling

o Past 2 weeks accomplishments

- Yalun Tang:
 1. Used microscope's objective lens to improve the efficiency of the coupling between laser and fiber.
- Quan Wang:
 1. Found the solution for brittle optical fiber after functionalization of gold nanoparticles
 - a. Gold nanoparticles are capped with citrate, tannic acid, or PVP capping agents
 - b. May react with surface chemistry reagent
 2. Planned a new method to attach gold nanoparticles
 - a. Dilute current solution in multiple ratios to observe
- Qinming Zhang:
 1. Designed and improved the etching platform.
 2. Measured and calculated the fiber and glass slide.
 3. Searched which adhesive is the best for the platform.
 4. Found the best way to drill holes on the glass slide surface.
- Jiameng Li:
 1. I tried the diameter in 8 micrometers fiber for simulating, analysing field distribution of this fiber.



2. Plotting the scattering data of the fiber from the simulation distribution
 - Finding the exact data near 4 microns in the surface plot of Energy vs position
 - Evaluate the data and decide whether it is durable for the fiber



o Pending issues

1. Need to purchase more single mode optical fibers, FC connector, 49% HF, and high density plastics.
2. Testing the new method of functionalization of gold nanoparticles
3. Coupling of laser has not reach a desired percentage

o Individual contributions

Team member	Contribution	bi-Weekly hours	Total hours
Yalun Tang	Improved the efficiency of the coupling between laser and fiber	10	20
Quan Wang	Found the problem of functionalization of gold nanoparticles, the reason causes brittle fiber	10	20
Jiameng Li	Analysing data I accumulated from plotting result, evaluating scatter around the margin of the fiber.	10	20
Qinming Zhang	Etching platform has been made. Practical test has been done.	10	20

o **Plan for coming weeks**

● Yalun Tang and Quan Wang(fabrication):

1. Perform the etching to try etch the fiber diameter into about 1 micrometer.
 - a. Find the etching rate
2. Perform the surface chemistry to test whether the new method causes brittle fiber
3. Install the Prepared fiber on the new designed platform then perform surface chemistry to immobilise the antibody for gold nanoparticles.

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

1. In next a few weeks, we will still working on comparing field distribution for different size of fiber without putting gold nanoparticle around the fiber.
2. For a specific fiber, we will set a gold nanoparticle in some different distance from the fiber to see the difference of field distribution.
3. Clip etching platform with glass slide, and then drill holes on the glass surface in order to let the HF solution in.
4. Carve some grooves on the etching platform surface, so that the etching platform and glass slide can be stick together properly.

Summary of meeting with Advisor:

For this week, we have finished creating and printing the etching platform which is made by solidwork. The next step is to officially start our testing work. We will use the best parameter of fiber found in the simulation of 2D model to etch our optical fiber, furthermore, finding out the etching rate can help us control the diameter of the fiber during the experiment. After we obtain a desired diameter of optical fiber which is around 4-8 micrometer, we will proceed to surface chemistry experiment, and at the same time achieving the best coupling ratio to observe the light scattering of gold nanoparticles.