

MERIT Long Term Overseas Dispatch

ETH Zurich
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Thanks to the great opportunity MERIT offered, I was able to experience overseas dispatch to ETH Zurich. I studied in deMello Group (<https://demellogroup.ethz.ch/en/index>) for 3 month.

I am researching semiconductor biosensor for immunology depending on Molecular Charge Contact Method. In Sakata Lab, I use magnet bead loading the signal to sensor. The problem I faced is that I can't control the movement of bead. This means That the amount of beads and the arrangement affect the signal. (Fig. 1)

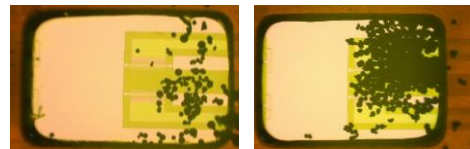


Fig.1 the various bead arrangement

In deMello Group, they mainly do research on micro-fluidics. Before I arrived, I was planning on making some kind of micro-fluidics device to help control the movement of beads, by making specific amount of beads stop on the sensing area. (Fig. 2)

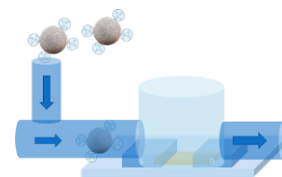


Fig. 2

After talking with Professor deMello and Dr. Stravros. We chose a new way to realize what I need. (Fig. 3)

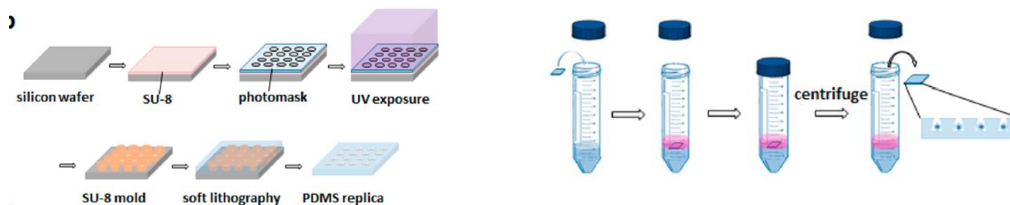


Fig.3 **REFERENCE** Huang L, Chen Y, Chen Y, et al. Centrifugation-Assisted Single-Cell Trapping in a Truncated Cone-Shaped Microwell Array Chip for the Real-Time Observation of Cellular Apoptosis[J]. Analytical chemistry, 2015, 87(24): 12169-12176.

By the method of reference paper, I made wells on PDMS chips and centrifuged to make bead drop in each different well. After testing by different speed, time, and size of well. I realize 88% attendance rate for the chip. This means that I could control beads go specific position. (Fig. 4)

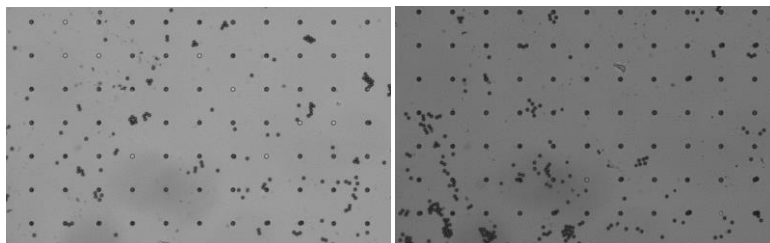


Fig. 4

Although I realized this by a $\varnothing 10\mu\text{m}$ bead in deMello Group, the bead that I am using in Japan is $\varnothing 100\mu\text{m}$. To apply it in my own experiment, I started to learn and practice making mold. deMello group are very professional in photolithography. I learned about how to choose photoresist, how to manage a proper mold systematically. I followed several group members' procedure and made two mould of my own successfully and transfer to PDMS chip. (Fig. 5)



Fig. 5

I used to use positive tone photoresist to make field effect transistor layers which rarely succeed. I am now considering to use some negative tone photoresist for easier control.

As for the life of Zurich, I have to say, it is a good place to study but hard to make a life. The price is extremely high and they might not have most Asian food that you are used to.



There are many mountains near Zurich you could hike on weekends but the transportation fee is still the biggest problem. I went to hike two times by using a kind of day pass which costs around 40CHF for each.

But even if you only stay in the city for weekends, it would not be so boring. Local Swiss friends are kind and might invite you to go their home for dinner. If you like football, you could enjoy FIFA museum in Zurich. Especially, the ice hockey tickets are much cheaper than those in America. If it is in the game season, you can get a ticket for 20CHF and relax by watching a game.



It was a very enjoyable experience and I highly recommend other student value the chance from MERIT and try a research in a different country and in a slightly different research focus.

I am very grateful to get support from Prof. Sakata, introduction from Prof. Kitamori, and the acceptance from Prof. deMello. And I really appreciate to have the help and direction from Dr. Stravros and every one in lab. Thank you all, I really enjoyed my study and 3 months life in Zurich.