卓越した大学院
「流動ダイナミクス知の融合教育研究世界拠点」
平成 29 年度　博士課程後期学生国際会議派遣　参加報告書

氏名／専攻・学年 Name / Department	張家興(Chang, Chia-Hsing)/ 機械機能創成専攻 D1
学会名 Conference's name	The 10th Asia-Pacific International Symposium on the Basics and Applications of Plasma Technology
開催地 Venue (Name of the facility, city & country)	Chung Yuan Christian University (Taoyuan, Taiwan)
日程 Conference period	2017/12/15-2017/12/17
発表タイトル Presentation Title	Effect of Pulsed Current on Cell Activity

【発表概要　Brief summary of your presentation】

Recently, low-temperature plasma has been used in variety fields, medical applications are one of the main topics. However, most of researches are focus on chemical reactions in aqueous phase, the influence of electrical transmission processes into cell growth is not developed completely. In this experiment, we construct the system that could not only use the same values as general plasma equipment, but also minimize chemical species generated by the plasma. By these, we can test whether the pulsed current affect cells or not to avoid electrically induced reaction by-products or pH changes in the cell culture chamber.

For the experimental setup, the salt bridge setup is for pulsed current transfers via the Ag/AgCl chloride electrodes and agarose bridges; internal agarose bridges were constructed by filling 8 mm glass tubing filled with 2% agarose to connect between the chamber and the containers filled with phosphate buffered saline (PBS). This configuration allowed us to physically isolate cells from pH variations and metallic wastes generated by the electrodes. Next, the cell culture chamber is composed by cover glass slide. For cell stimulation testing, we will put the culture-insert inside the chamber for culturing 24 hours to create the 500μm±50μm gap between two well to observe cells migration and control uniform pulsed current flow through cells. We selected HT-1080 (JCRB, JCRB9113, human sarcoma cell line) for our experiments. Each well added 2×10^5 cells to pre-culture for 24 hours and the chamber stimulated for 6 hours in various conditions.

We tested three different conditions, control, stimulation with 100Hz and 1000Hz. Especially, the rising time for current was less than 10 ns and the current width was 180 ns. During the treatment, pH value and temperature were constant based on 3 times tests for all condition including the control sample without stimulation. The cell activity was evaluated with migration ability and cell number. After the stimulation cases, cells were extended more longer and overlapped to each other and reached to center easier. Indeed, the nanosecond pulsed current affected cell activity. Due to the decrease of cell number, the cell was tardy in growth by the stimulation. Moreover, the cells with 100 Hz simulation showed almost no proliferation at 24 hours after the treatment, compared to that with 1000 Hz stimulation. This result may be due to the higher current and voltage in 100 Hz case.

【他の講演等から得られた知見、感想等。What you learned from other presentations, general impression you had, etc.】

This was the third time for me to attend the APSPT conference, every time I could learn lots of new idea and applications in here. The plasma science is now the top issue using in our next generation, especially in medical field, and atmospheric pressure plasma is the suitable application in the bio-field.

In APSPT-10, they invited the famous scientist, Peter J. Bruggem, who is well known in plasma-liquid science which recently has many possible applications in materials, environmental and biomedical fields. According his talk, he showed that using plasma over the liquid surface will create bio-chemical or active species; moreover, understanding and controlling plasma-liquid interactions, and this met with my research, so it was very excellent experience to listen the master in front of you. Most presentations were important and worth to discover, like impact of intense nanosecond electrical pulses on protein, plasma gene transfer charged particle/reactive species, and so on. Of course, there were many excellent young researchers, some of theirs research topic was similar with mine, and also students from Kumamoto University, which I will visit next year to train my experimental skills, had the discussion with me. We exchanged our experience and became friend with each other.

Finally, for this conference, I thought it was hold successfully and I really enjoyed everything, not only sections but also foods. Additionally, about the organizer, Pro. Wei is the hospitable and energetic person, I knew him when I was the master student in Taiwan, and he had done many works on this APSPT-10, so no one will doubt that this is the pleasant conference.

【写真 Pictures】