



2017 Tatung-Osaka Institute of Technology International Project-Based Program Book

August 8~August 12, 2017

Day 1 (Aug. 8, Tuesday)

| | |
|-------------|---|
| 13:10~15:10 | Flight and Arrival at Taoyuan Airport |
| 16:00~17:00 | Take bus to Tatung University |
| 17:00~17:50 | Check in Tatung Scholar House |
| 17:50~17:55 | Meet in the lobby of Tatung Scholar House |
| 18:00~ | Welcome dinner |

Day 2 (Aug. 9, Wednesday)

| | |
|-------------|---|
| 09:00~12:00 | Hydrogel material experiment and demo |
| 12:00~12:30 | Take MRT to Tamsui |
| 12:30~18:00 | Visit Tamsui old street, Fisherman's wharf, enjoy Tamsui sunset and local food |
| 18:00~18:30 | Go back to Tatung University |

Day 3 (Aug. 10, Thursday)

| | |
|-------------|--|
| 08:50~09:00 | Meet at Main gate of Tatung University |
| 09:00~10:00 | Take bus to Yilan |
| 10:00~11:00 | Visit Orchid garden of Jiaosi of King Car Group |
| 11:30~12:00 | Arrive at Kavalan whisky and watch the introduction video of King Car Group |
| 12:00~13:00 | Lunch at the restaurant of Kavalan Whisky |
| 13:00~14:00 | Visit the whisky manufacturing factory |
| 14:00~14:30 | Visit Jim & Dad Beer Brewery |
| 14:30~15:30 | Visit Yilan Brewery of TTL |
| 16:00~17:00 | Visit Jiaosy Hot Spring Park |
| 17:00~18:00 | Go back to Taipei from Yilan |
| 18:00~ | Diner at Taipei |

Day 4 (Aug. 11, Friday)

| | |
|-------------|---|
| 09:00~10:00 | Prepare wrap-up presentation poster (A2 size) |
| 10:00~12:00 | Wrap-up presentation |
| 12:00~13:30 | Lunch |
| 13:30~ | Free activity |

Day 5 (Aug. 12, Saturday)

- 11:00~12:00 Take bus to Taoyuan Airport
12:00~12:30 Flight Check in
14:20~18:50 Flight and Arrival at Kansai Airport

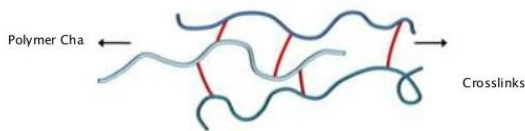
PBL: Synthesis and Applications of Hydrogel Materials

Instructor: Professor Wen-Fu Lee

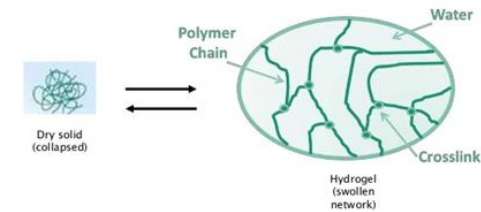
Introduction

The term 'hydrogel' first appeared in the literature was in 1894. It is defined as a hydrophilic three-dimensional network of polymer chains which can swell but not dissolve in aqueous solution.

CROSS-LINKING = POLYMER NETWORK



EFFECT OF WATER

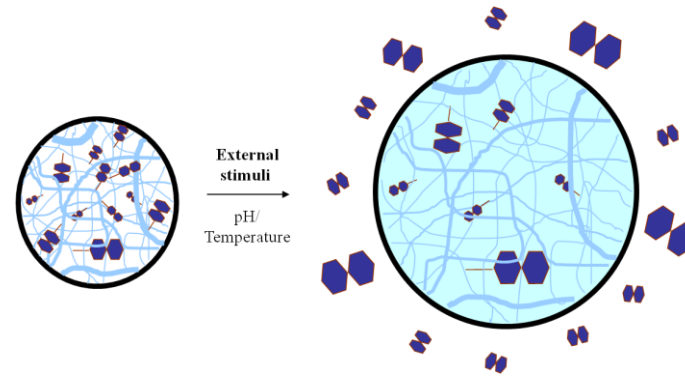


Hydrogels are highly absorbent material due to their hydrophilic structure. It can absorb plenty of water (up to one thousand times their dry weight) and hold water inside the structure. This property along with biocompatibility of hydrogel results in numerous applications in contact lenses, tissue engineering, and many biomedical fields. Other common applications of hydrogels include:

- | | |
|-------------------------|------------------------------|
| Pharmaceutical | Agriculture |
| Sanitary pads | Trans-dermal systems |
| Dental materials | Drug delivery |
| Implants | Injectable polymeric systems |
| Ophthalmic applications | |
| Wound dressings | |
-



Hydrogels can be designed to be stimuli sensitive and respond to surrounding environment. These hydrogels can perform dramatic volume transition in response to a variety of environmental stimuli like temperature, electric or magnetic field, light, pressure, sound, pH, solvent composition, ionic strength, and molecular species. And these stimuli-response properties can be applied on the drug releasing system and biosensor.

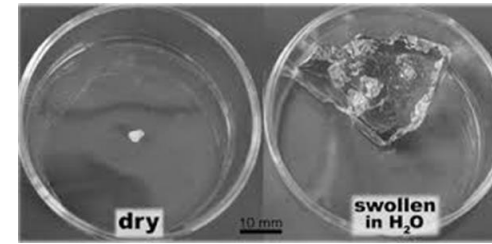


Preparation of hydrogel

NIPAAm, NMBA, APS, AA, and NaOH are added into the sample bottle with the amounts according to the table 1. Water is added into the bottle until the total volume of solution is 20mL. After that, the bottle is placed into ice bath and add 1 drop of TEMED. The solution is then injected into the mold that is immersed in hot water bath to perform polymerization. After the reaction is finished, the hydrogel is cut into disks and washed by distilled water/methanol. Finally, the gel disks are dried at room temperature, 40 °C and 75 °C, respectively.

Table 1 Feed compositions of different hydrogels

| Gel code | | NIPAAm (g) | NMBA (g) | APS (g) | AA (g) | 0.12M NaOH (mL) |
|----------|----------|------------|----------|---------|--------|-----------------|
| G1 | designed | 2.712 | 0.111 | 0.026 | - | - |
| | actual | | | | | |
| G2 | designed | 1.81 | 0.074 | 0.0182 | - | - |
| | actual | | | | | |
| G3 | designed | 2.58 | 0.111 | 0.052 | 0.086 | - |
| | actual | | | | | |
| G4 | designed | 2.58 | 0.111 | 0.052 | 0.086 | 5 |
| | actual | | | | | |
| G5 | designed | 2.58 | 0.111 | 0.052 | 0.086 | 10 |
| | actual | | | | | |



Measurement of Swelling Ratio

Weight of dried gels (W_d) are measured at first. And the gels are immersed in distilled water at 25 °C. The gels are removed from the water bath and measured the weight of wet gel (W_w) at various time intervals. The swelling ratio (SR) was calculated by the following equation:

$$SR = \frac{W_w - W_d}{W_d}$$

Demonstration of hydrogel features

- Swelling behavior
- Temperature response
- pH response
- Drug absorption

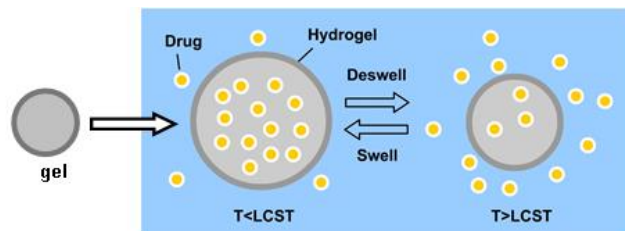


Table 2 Weights of different gels at different times

| time (min) | G1 (g) | G2 (g) | G3 (g) | G4 (g) | G5 (g) |
|------------|--------|--------|--------|--------|--------|
| 0 | | | | | |
| 10 | | | | | |
| 20 | | | | | |
| 30 | | | | | |
| 40 | | | | | |
| 50 | | | | | |
| 60 | | | | | |

Swelling behavior observation

Two dry gel disks are placed in air and 25 °C deionized water, respectively. After for 10 minutes, weighting and observing the hydrogel.

Temperature response observation

Two hydrogels swollen in deionized water at 25 °C are placed in 25 °C and 37 °C deionized water, respectively. After 10 minutes, the hydrogels are weighed and observed the difference.

pH response observation

Two hydrogels swollen in deionized water at 25 °C are placed in pH 2.0 and pH 11 solutions, respectively. After 10 minutes, the hydrogels are weighed and observed the difference.

Drug Release Experiment

The drug (crystal violet/ phenol red) release experiments are carried out by transferring previously incubated-drug hydrogels into 10 mL deionized water at 37 °C and 25 °C, respectively. The hydrogels are repeatedly removed and transferred into 10 mL deionized water at each fixed time interval. The drug released

amounts will be observed via the difference of color.

Table 3 PBL participants and group members

| Group | Member 1 | Member 2 | Member 3 | Member 4 | Member 5 |
|-------|----------|----------|----------|-----------------|------------------------|
| 1 | PHOEBE | LUCY | ALAN | IWAMOTO SHOTO | SHIRAI YUKO |
| 2 | JOY | VIVIAN | CINDY | MIZUTA SAKI | KAKUCHI YUKA |
| 3 | TERRY | EMILY | MATT | YOSHIOKA MANAMI | RONNY CHRISTIADI SALIM |
| 4 | JACK | NATASHA | AMOS | NAKATOMI KOTA | SHINTA MASYTA SIPAYUNG |
| 5 | COLIN | TERRY | PEGGY | DONG JIANHUI | MURAGUCHI NANAMI |

PBL program coordinators:

Professor Yi Hu (TTU)

Professor Toshiya Fujisato (OIT)

PBL program secretary: Ms. Fong-Yi Huang

PBL program assistant: Natasha Chang

| Date 日期 | Time 時間 | 行程 | 說明 | 人員 |
|---------------------|-------------|---|--|---|
| 1 08/08 (Tue) | 13:10-15:10 | Osaka Kansai 關西空港 13:10 中華航空 CI157 出發 Taoyuan Airport 桃園空港 15:10 抵達 | | 陳建先老師、學伴隊長張筑鈞 |
| | 16:00 | | 接機 e-go 20 人座巴士 | |
| | 17:00 | 安頓入住大同大學學人宿舍 | STUDENTS 學生:大同大學學人宿舍(德惠大樓) 台北市中山區德惠街 3 巷 3 號 PROFESSORS 教員:CK Serviced Residence 台北晴光好居公寓 No. 8, Nong An St, Zhongshan Dist, Taipei 10491 台北市中山區農安街 8 號 TEL: +886-2-2592-7860 | |
| | 18:00 | Welcome party(海霸王) | | 大阪師生、學伴、工程學院各系主任、院長、校長、林副校長、陳克紹老師、段國仁老師、陳建先老師 |
| 2 08/09 (Wed) | 09:00-12:00 | 學術活動 Academic activity (Thermosensitive hydrogel synthesis) (Hydrogel characterization and drug release test) | (大同大學實驗大樓 804) | 李文福老師、交流學生、學伴 |
| | 12:00-18:00 | Urban communication Taipei City 台北市 | 到淡水體驗美食，淡水阿給、鐵蛋及巨無霸冰淇淋等，台灣的兒時玩具及零嘴在這裡都能 | 交流學生、GS1 04 高唯禎 (可用日文) |

| | | | | | | |
|---|----------------|-----------------------------|--|---|---|---|
| | | | 淡水 | 體驗，下午的時間天氣較舒適可以選擇逛逛老街或是騎腳踏車沿路欣賞風景，黃昏時淡水河邊有許多咖啡廳可以休息一下看吹海風欣賞美麗的夕陽。 | 溝通) GS1 12 陳建元 (可用日文溝通) T4B 07 許騰文 T2B 34 羅善 S4 20 吳鈺真 S4 52 王湘瑜 | |
| 3 | 08/10 (Thu) | 參訪 Factory trainee activity | | | Yi-Lan City 宜蘭市 Factory trainee activity King Car Industrial Co., Ltd 金車股份有限公司 | 大阪交流師生、學伴(自由參加)、 陳志成主任、陳克紹老師 帶隊老師:段國仁老師 |
| | | 08:50 | 校門口集合 | | | |
| | | 09:00 | 出發往宜蘭 | | | |
| | | 10:00~11:00 | 金車礁溪蘭花園 | | | |
| | | 11:30 | 抵達威士忌酒廠(觀賞金車公司 | | | |
| | | 12:00~13:00 | 簡介) | | | |
| | | 13:00~14:00 | 在葛瑪蘭酒廠內用餐 | | | |
| | | 14:00~14:30 | 參觀葛瑪蘭威士忌酒廠 | | | |
| | | 14:30 ~ 15:30 | 參觀吉姆老爹精釀啤酒廠 | | | |
| | | 16:00 ~ 17:00 | 參觀宜蘭酒廠 | | | |
| | | 17:00 ~18:00 | 參觀礁溪溫泉公園 | | | |
| | | 18:00 | 返回台北 台北用餐 | | | |
| 4 | 08/11 (Fri) | 9:00-13:30 | 學術活動成果展演 Academic activity (Wrap-up | 大同大學志生館 分享所見所學(A2海報、麥克筆、照片等) | 交流學生、學伴 院長、各系系主任 | |

| | | | | | |
|---|----------------|--------|--|--|----------|
| | | | Presentation) Tatung Univ大同大学 | | |
| | | 13:30- | 自由活動Free Activity | | 交流學生、學伴 |
| 5 | 08/12 (Sat) | 11:00 | 搭車前往機場 Taipei Taoyuan台北桃園空港 14:20中華航空CI172 出發 Kansai Airport關西空港18:50抵達 | 送機 e-go 20人座巴士 Check-in Taoyuan Airport 桃園空港 | 學伴 2~3 人 |