



# 2019「中技社科技獎學金」

2019 CTCI Foundation Science and Technology Scholarship

## 研究獎學金 Research Scholarship

### 高孔隙之多變色螢光奈米纖維及其pH與Hg<sup>2+</sup>離子多重感測應用

### RGB-Switchable Porous Electrospun Nanofiber Chemoprobe-filter Prepared from Multifunctional Copolymers for Versatile Sensing of pH and Heavy Metals

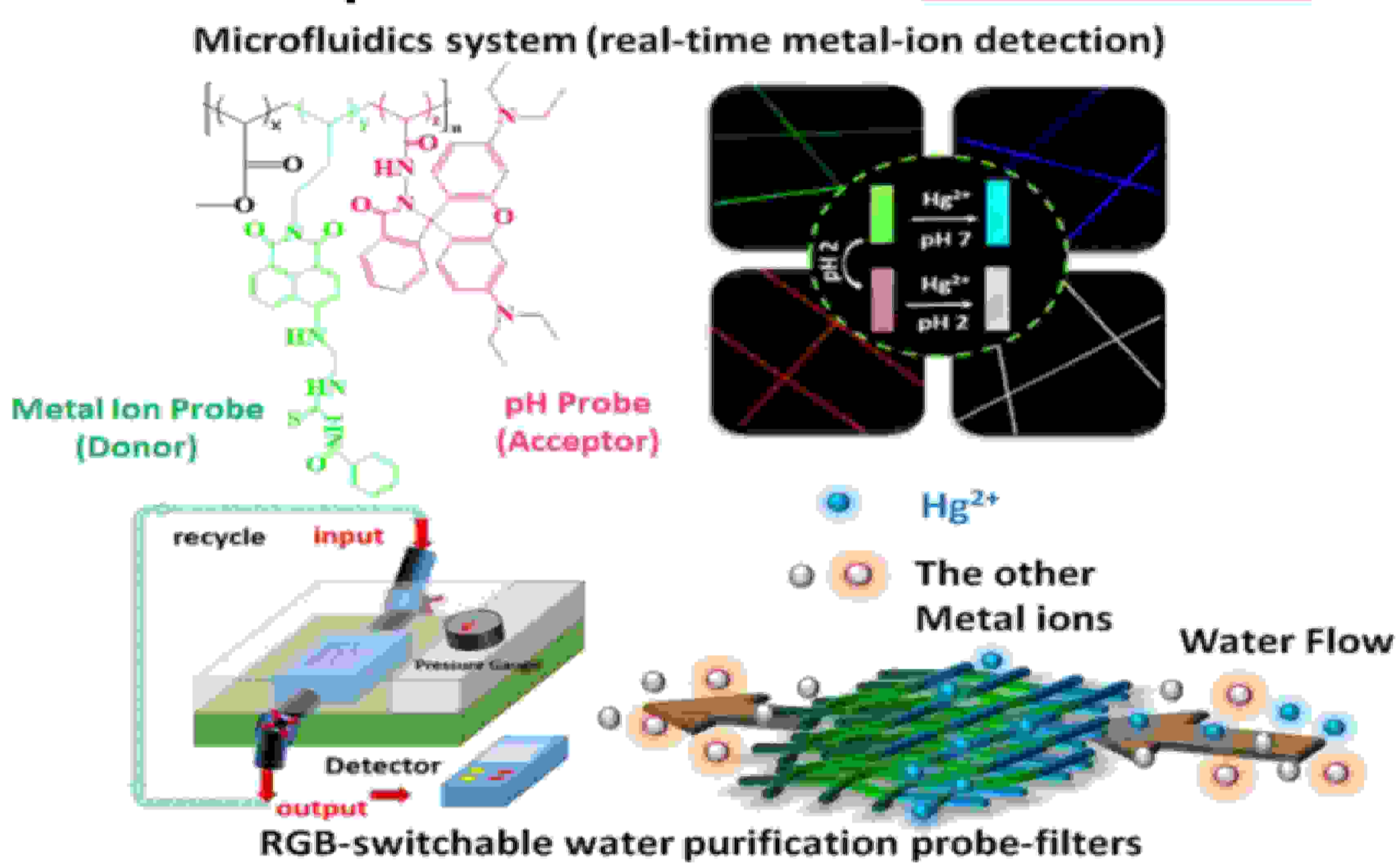
國立台北科技大學 化學工程與生物科技系 博士班四年級 梁芳誠  
指導教授 郭霽慶、李文亞 教授



#### 研究重點

#### Concept

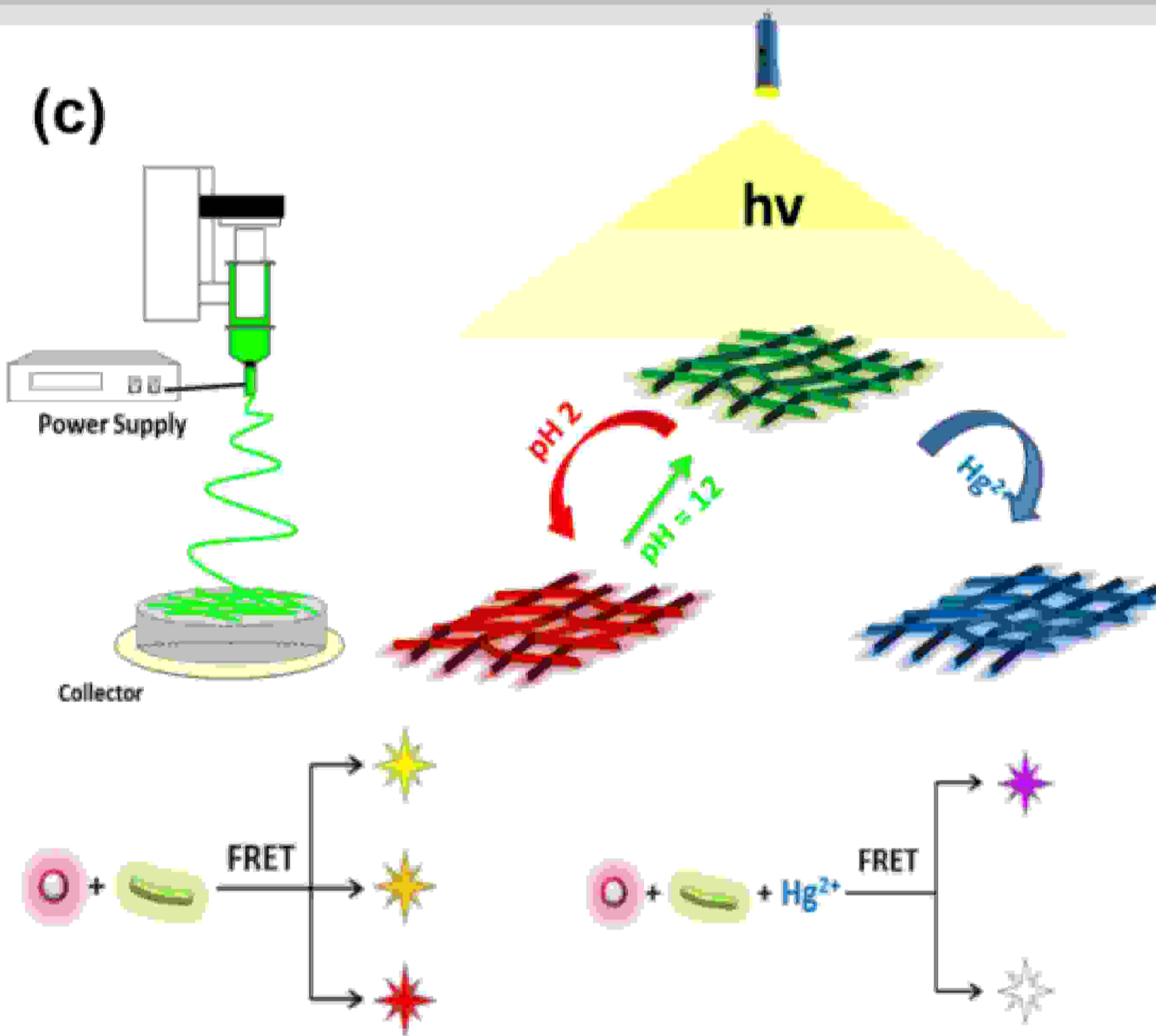
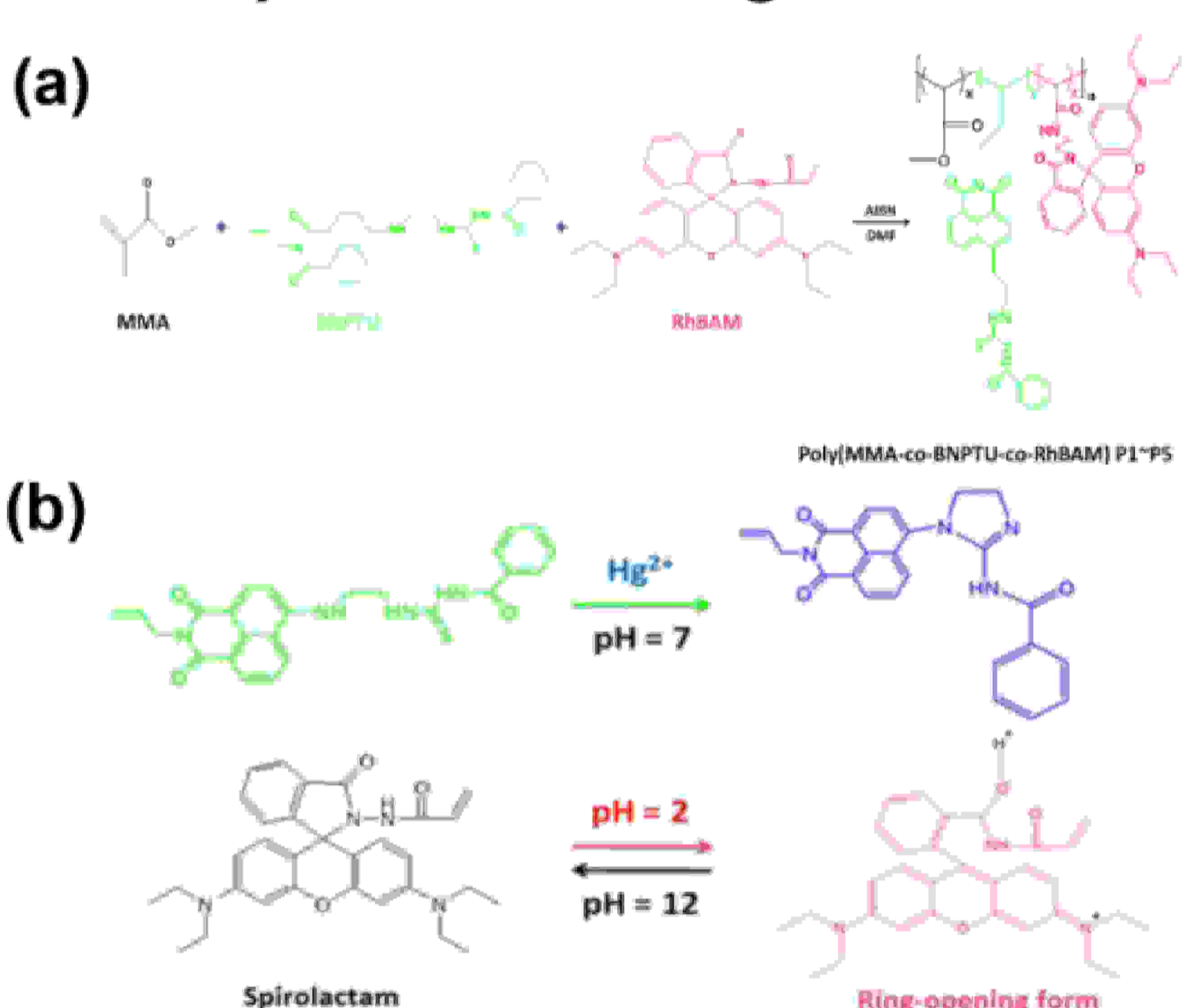
Patent : TW105123231



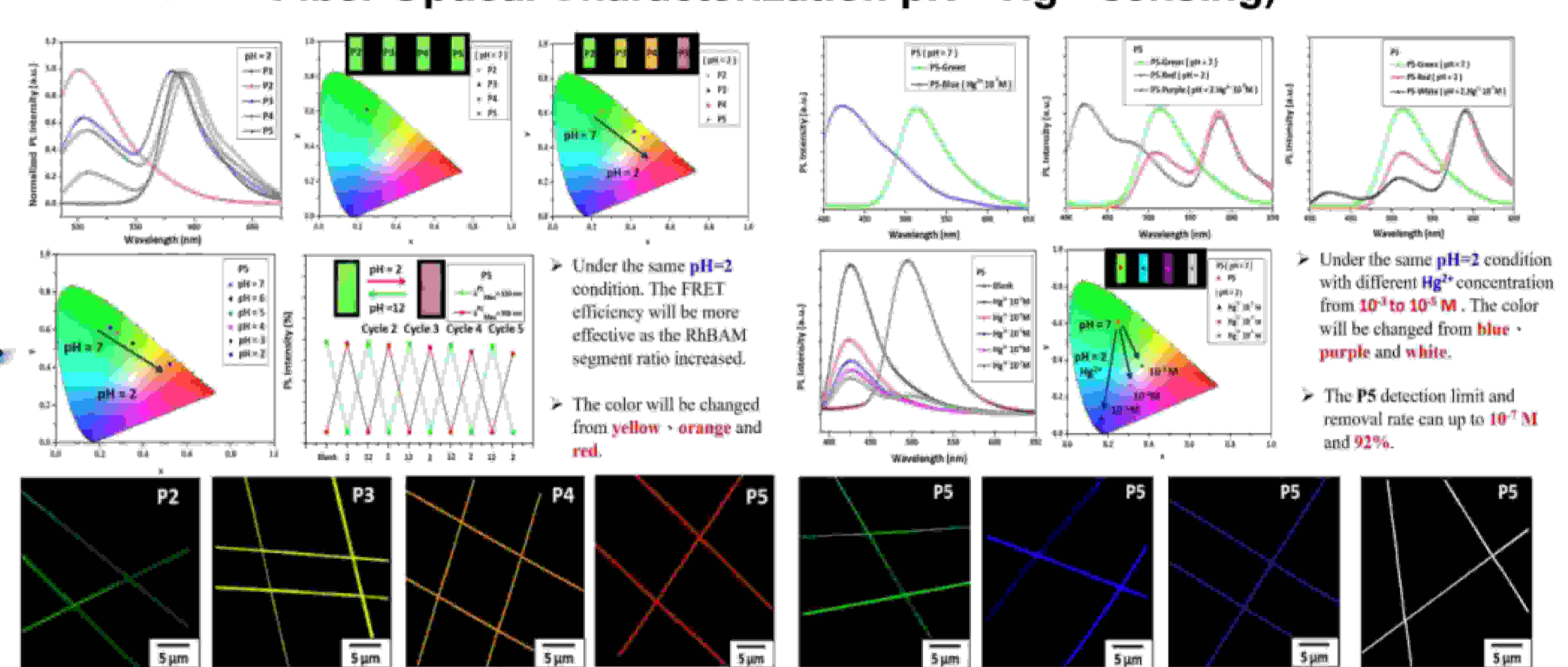
- The FRET-based fluorogenic probe ES nanofibers developed in this study were prepared using (poly(MMA-co-BNPTU-co-RhBAM)) copolymers containing a naphthalimide derivative and a spiro lactam rhodamine derivative; the MMA, BNPTU, and RhBAM moieties were designed to (i) **permit formation of porous fibers**, (ii) **fluoresce for Hg<sup>2+</sup> detection**, and (iii) **fluoresce for pH**.
- The fluorescence emission of BNPTU (fluorescence resonance energy transfer (FRET) donor) changed from green to blue as it detected Hg<sup>2+</sup>. The fluorescence emission of RhBAM (FRET acceptor) was highly selective for pH, changing from nonfluorescent (pH 7) to exhibiting strong red fluorescence (pH 2). The full-color emission of the ES nanofibers included **green, red, blue, purple, and white** depending on the particular pH and Hg<sup>2+</sup>-concentration combination of the solution.
- The porous ES nanofibers had a higher surface-to-volume ratio than those of corresponding thin films, which enhanced their performance. The present study demonstrated that the FRET-based full-color-fluorescence porous nanofibrous membranes, which exhibit on/off switching and can be used as naked eye sensors, have potential for application in water purification sensing filters.

#### 研究成果

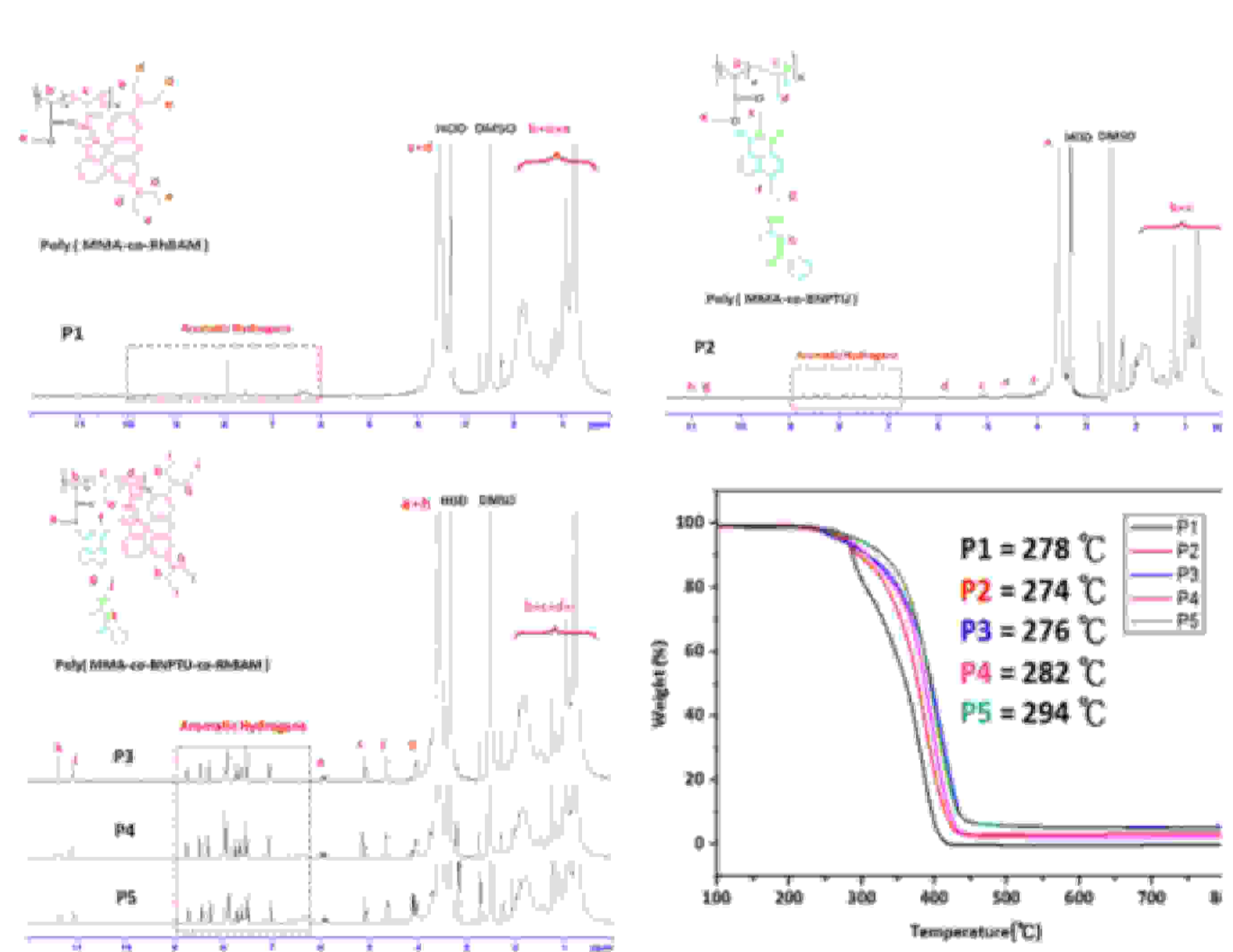
#### Experimental Design



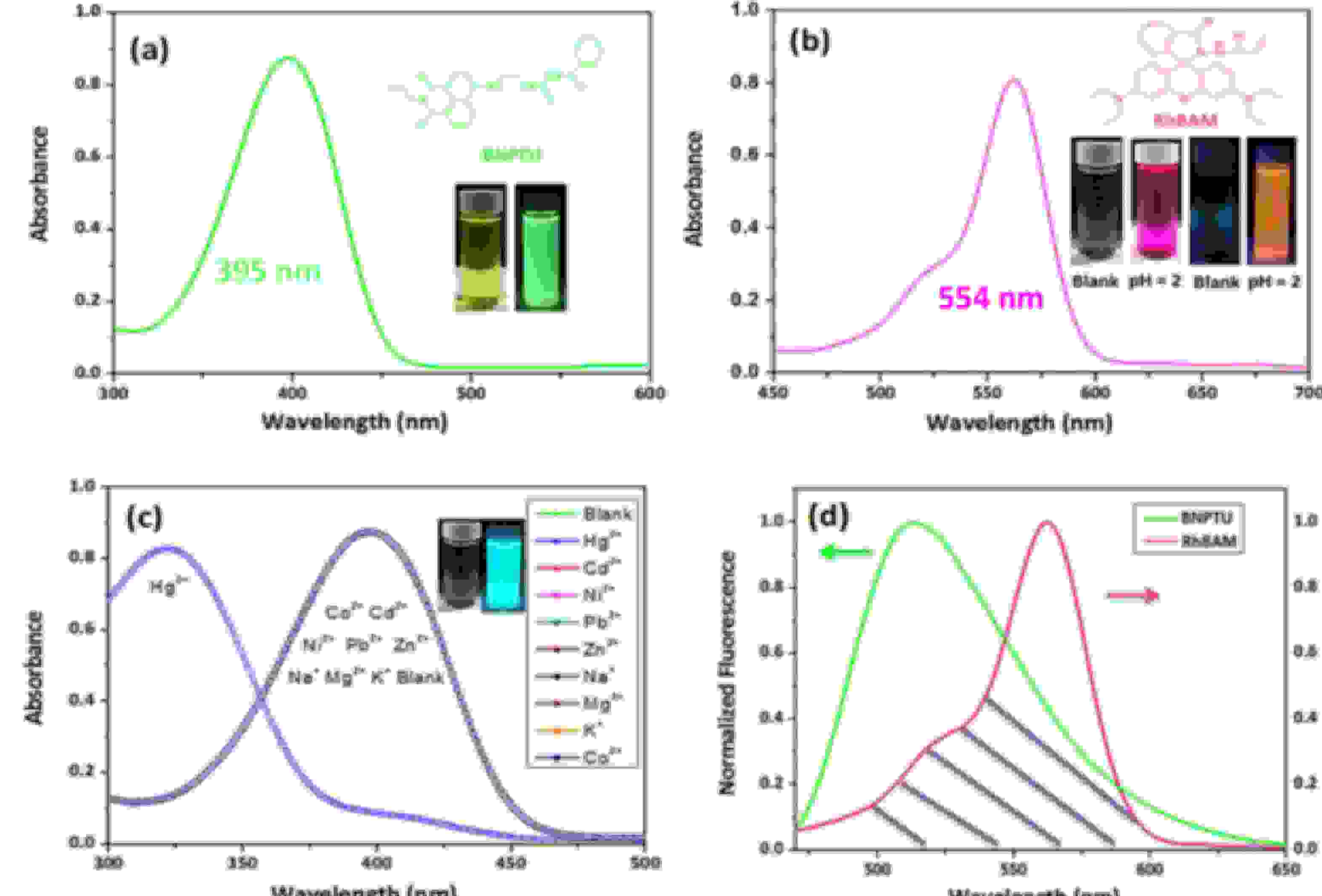
#### Fiber Optical Characterization pH、Hg<sup>2+</sup> sensing



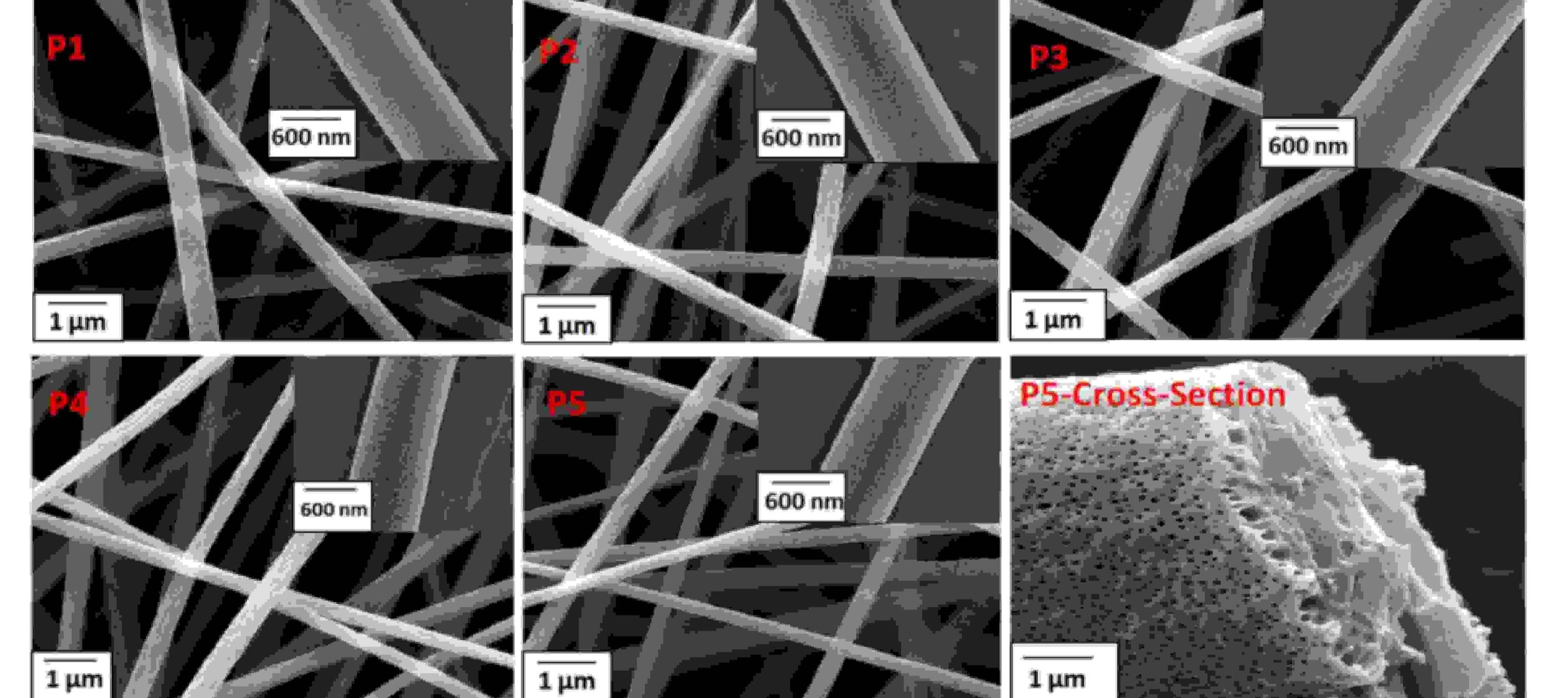
#### NMR and TGA



#### UV and PL spectrum



#### SEM Morphology



#### 研究生活與心得

博士生涯一轉眼就要結束了，能夠完成台北科大與法國格勒諾布爾的雙博士學位，我最要感謝的是我的指導教授兼亦師亦友-郭霽慶。感謝教授給予大量的資源投資在我的身上，並時常鼓勵與督促我，讓我可以順利完成博士班的目標。而在這段生涯裡我也接受了很多從未遇過的挑戰，這些挑戰可以說是在我人生中最大的幫助，因為能從中體驗未知的冒險以及接觸各國文化的洗禮，這當中涵蓋了自己獨立勇闖法國留學以及學習如何適應新的環境。這些無比的挑戰都是幫助我提前適應社會上的歷練。

衷心感謝中技社評審委員們的肯定，讓我能夠榮獲研究獎學金，以及台北科技大學化學工程與生物科技系的張華蘭承辦人與李文亞教授的推薦、臺大陳文章教授與法國Redouane Borsali教授對研究上的細心栽培與教誨，讓學生有機會能參與海外移地研究，增進國際視野與提升學術涵養。最後要感謝栽培我的父母，能尊重我的每項決定，並讓我能無憂無慮的專心讀書與研究，成為我最堅強的後盾。未來我會繼續在此領域上鑽研與研究、深耕學習，秉持著實驗的精神與初心，將所學回饋社會。



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