



2020「中技社科技獎學金」

2020 CTCI Foundation Science and Technology Scholarship

研究獎學金
Research Scholarship

合成共軛雙嵌段共聚的型態結合LED的應用

Morphology, Photo-Physical Properties, and LED Application of Rod-Coil Block Copolymer



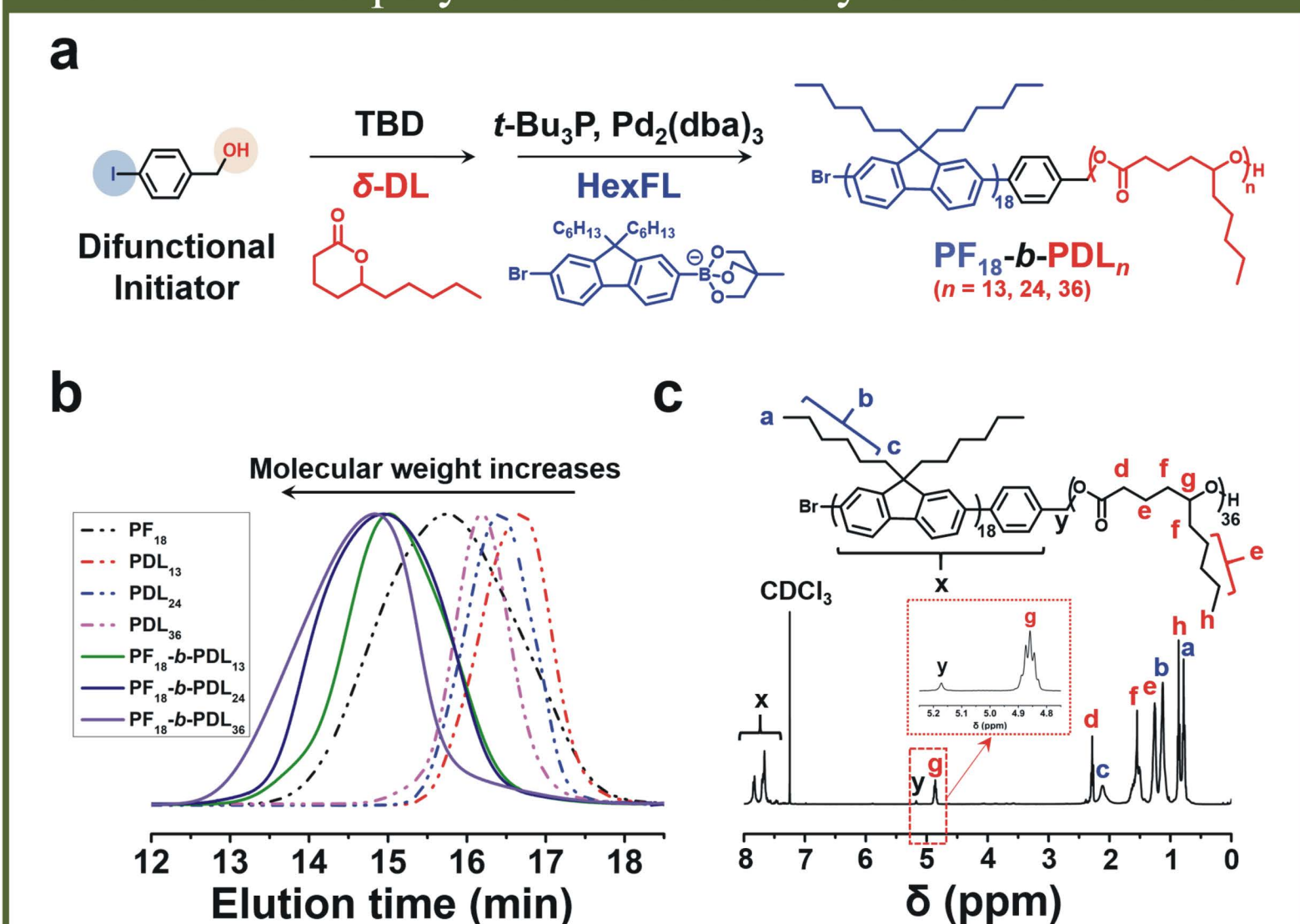
國立台灣大學 高分子科學與工程學研究所 博士班三年級

研究摘要

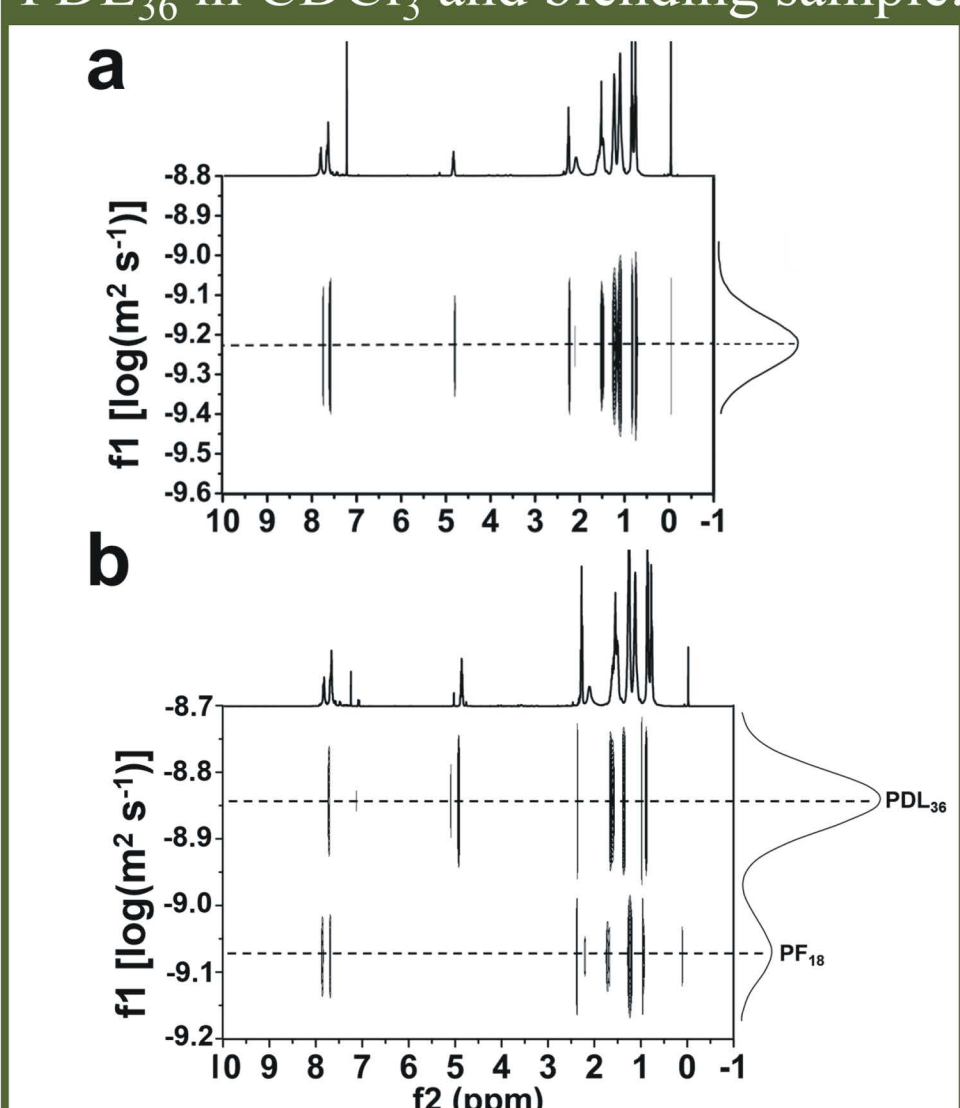
A series of polyfluorene-*block*-poly(δ -decanolactone) (PF-*b*-PDL) conjugated block copolymers have been synthesized using a smart one-pot procedure that involves simple purification for fabricating touch-responsive light-emitting diode (LED) devices. Compared with PF homopolymer, the block copolymers exhibit higher photoluminance quantum yields and higher exciton binding energies. PF₁₈-*b*-PDL₁₃ specifically, exhibits external quantum efficiency (EQE) that is 6 times higher than PF homopolymer. Moreover, because the coily PDL block induces a highly stable bound state, the block copolymer LEDs exhibit a higher device lifetime and exciton binding energies than the homopolymer LEDs. Furthermore, the novel block copolymers exhibit higher carrier recombination efficiency and flexibility than PF homopolymer did, which highlights the potential of these block copolymers for fabricating wearable microelectronic devices.

研究成果

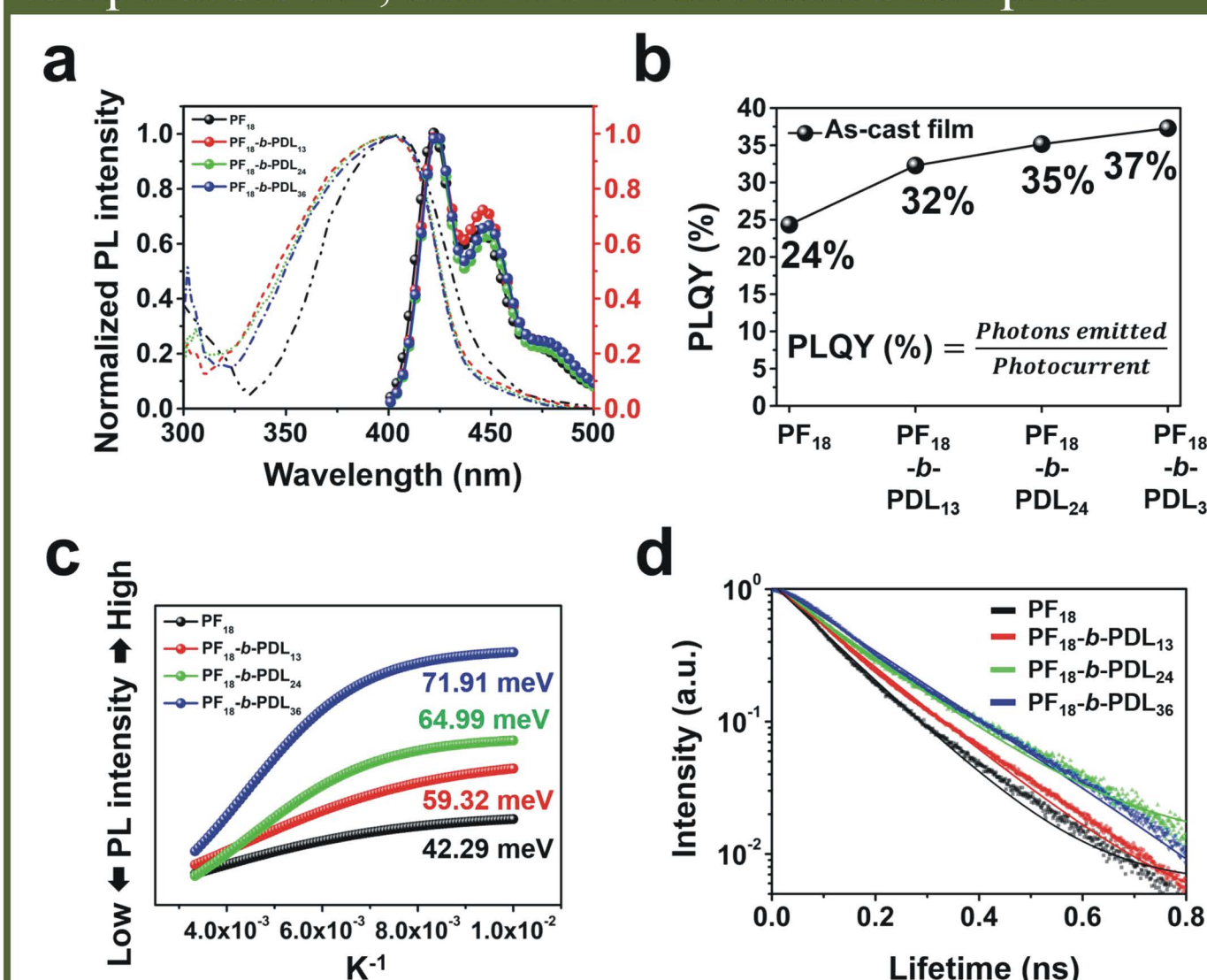
The synthesis of PF₁₈-*b*-PDL_n block copolymers mechanisms and polymer structure analyzed and confirmed.



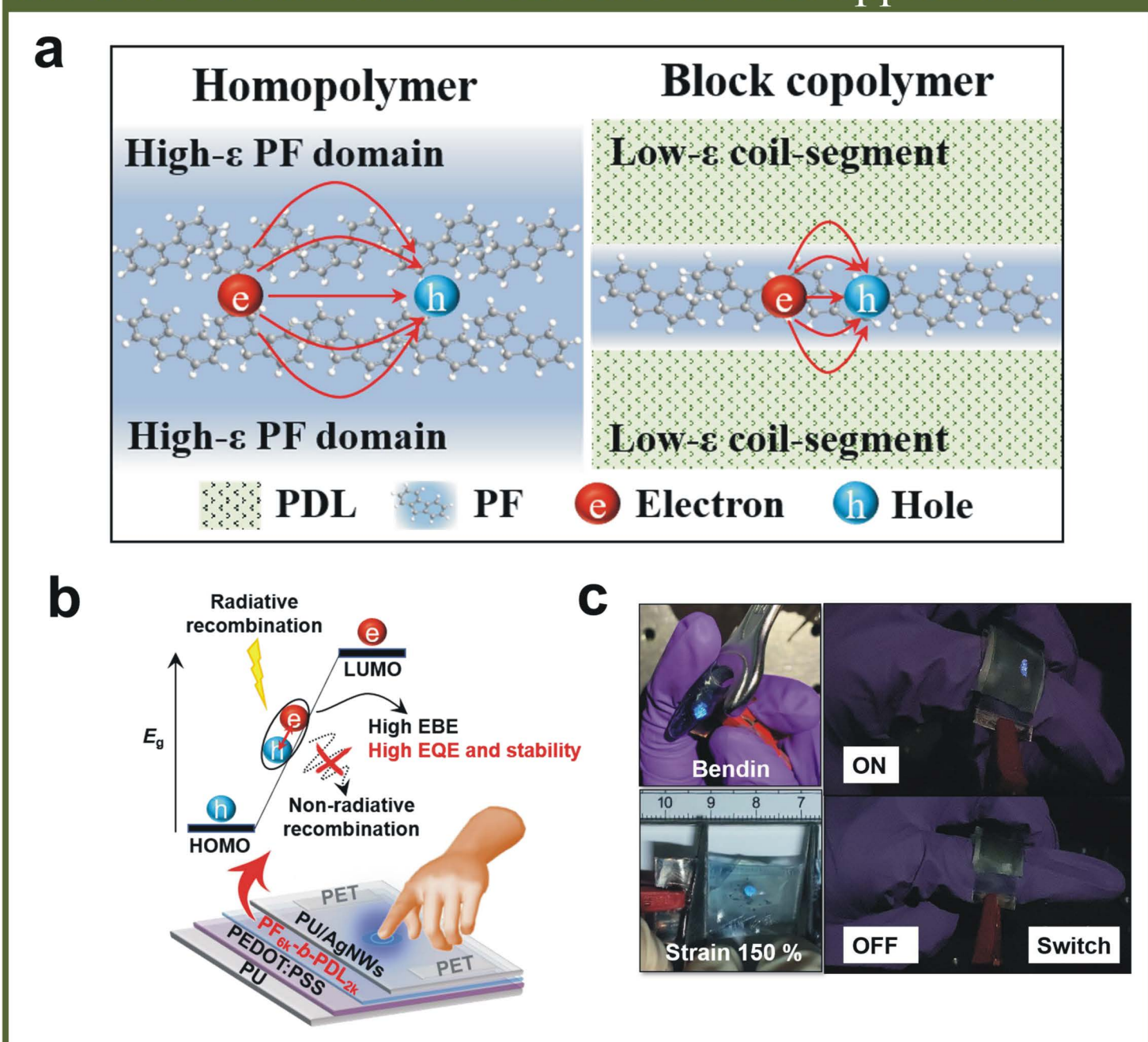
DOSY NMR spectrum of PF₁₈-*b*-PDL₃₆ in CDCl₃ and blending sample.



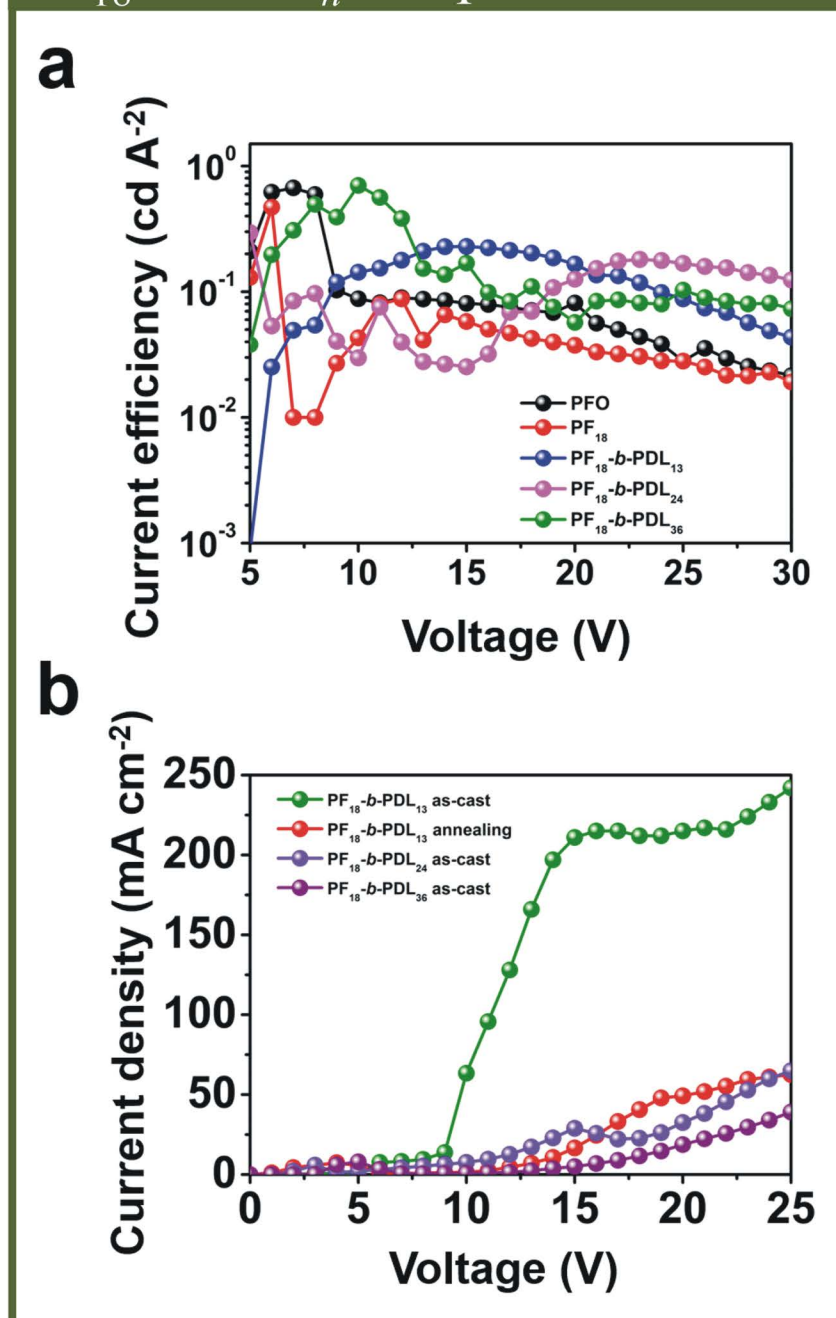
UV-vis absorption, PL emission spectra, PLQY, temperature-PL, and TR-PL of studied samples.



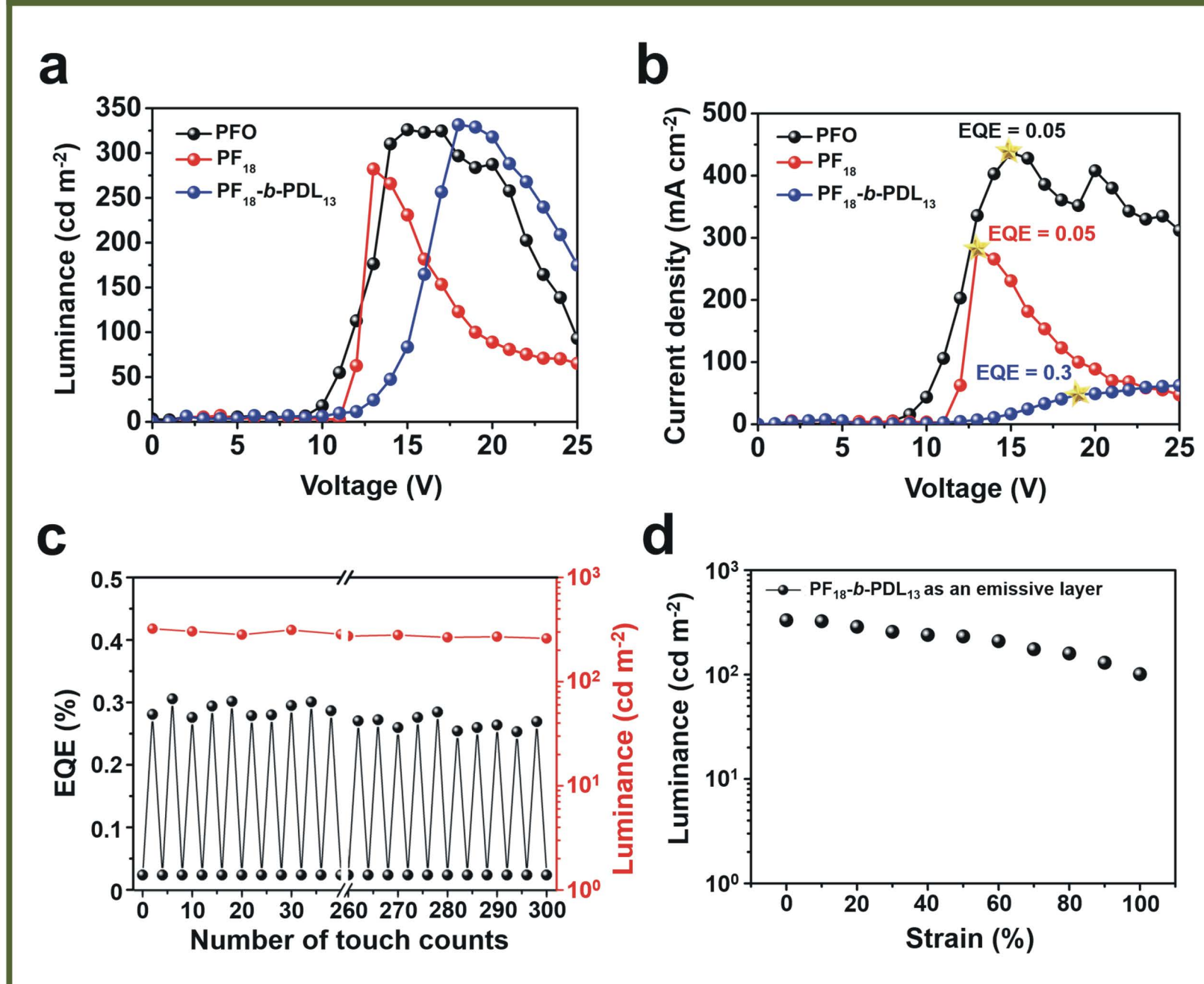
Explanation of the various dielectric constant effects in the stable bound state of excitons and the application.



CE-*V* and *J-V* characteristics of PF₁₈-*b*-PDL_n samples.



L-V, *J-V*, and durability characteristics of the touch-responsive LEDs.



研究生活與心得

從做研究一路來，非常享受著做研究的喜悅，一直以來以能夠對人類認知世界做出獨創性且具有影響力的貢獻為目標。或許只是小小的研究，但對於研究內容的探索和理解卻是有著豐富的奧妙和知識。從對此研究的無知到現在的深入探討與應用，回頭看自己的各項技能確實提升不少，但人必須要向前看齊，未來肯定會有更多的困難與磨練，也期許自己未來能夠發揮所長回饋社會和國家。最後要謝謝，一路給予指導的老師們和研究團隊，才能讓我有如此美好的學習環境和豐富知識的成長。再來更要謝謝親朋好友，對於我選擇博士這條路的肯定和鼓勵。最後更要感謝提供研究獎學金的中技社，使我不僅獲得實質上的支持，從而也得到精神上的肯定，我將用滿懷感激的心持續致力於研究和積極的面對未來的挑戰。



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