# 2022「中技社科技獎學金」

## 2022 CTCI Foundation Science and Technology Scholarship

## 研究獎學金

## Research Scholarship

# 以介面工程改善鐵電氧化鉿鋯記憶體之可靠度表現

# Improved Reliability of Ferroelectric HfZrOx-based Memory with Interface Engineering

國立清華大學 工程與系統科學系 博士班三年級 彭皓楷

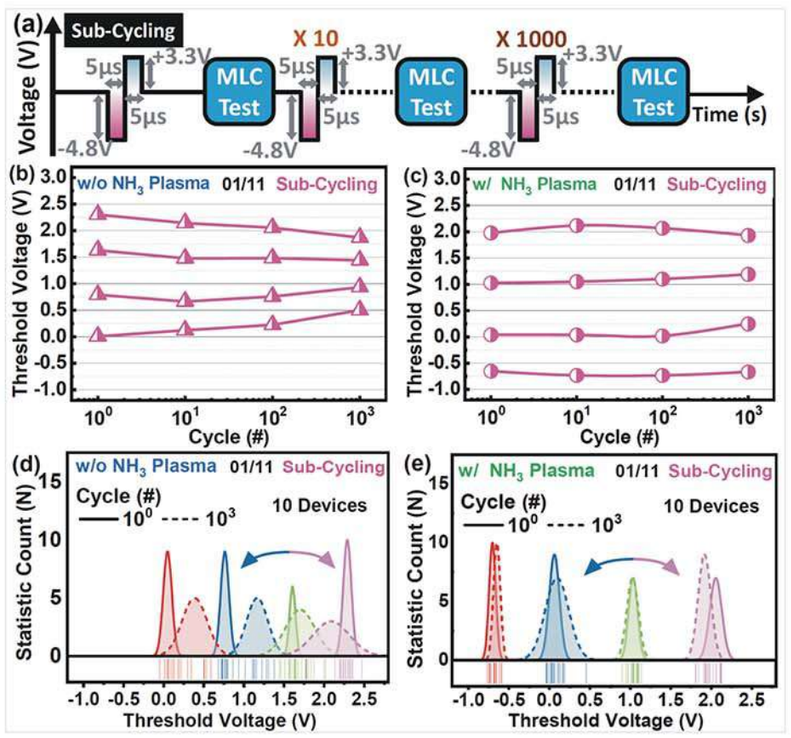
指導教授：巫勇賢 教授

## 研究重點

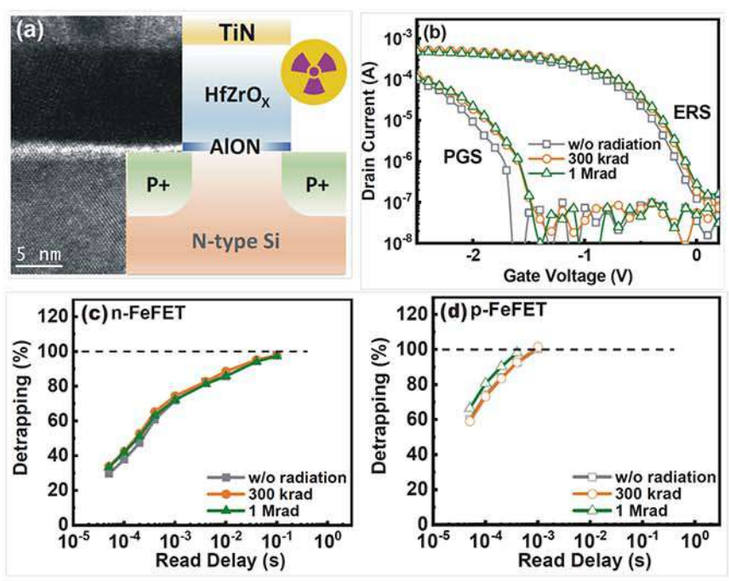
We identify the memory window (MW) closure of FeFETs under repeatedly cycling with partial dipole switching (sub-cycling). With $NH_3$-plasma treatment, the FeFETs show improved threshold voltage stability by sub-cycling operation. To broaden the applications of FeFETs, we also investigate the impacts of radiation and scaling down of the ferroelectric layer. Low read-after-write latency for p-FeFET is demonstrated even with high radiation dosage. We also reduce the difference of MW between n-FeFET and p-FeFET with scaled 5 nm HZO and AlON interfacial layer. For future technology nodes, we have developed several annealing schemes to enhance the performance of Ge-based ferroelectric memory.

## 研究成果

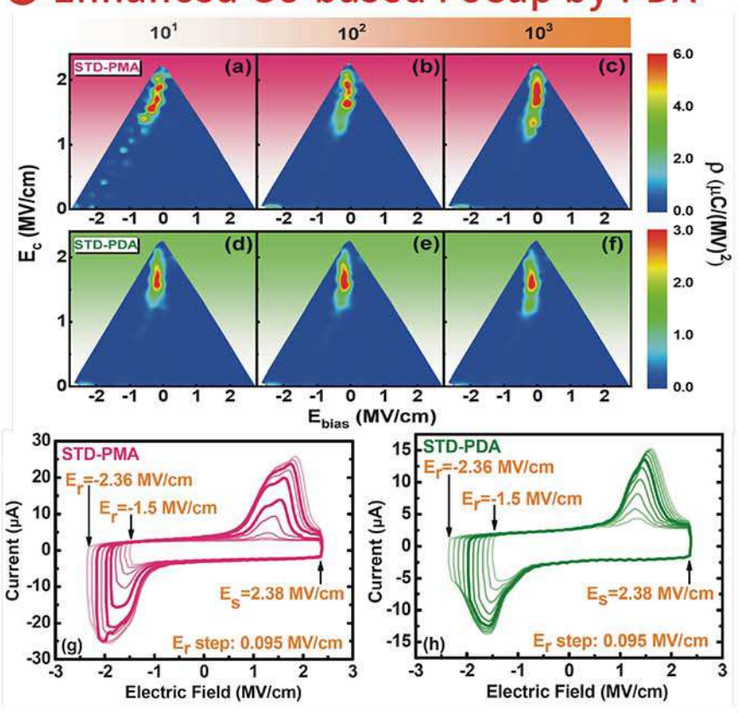
### ● Improved sub-cycling stability with $NH_3$



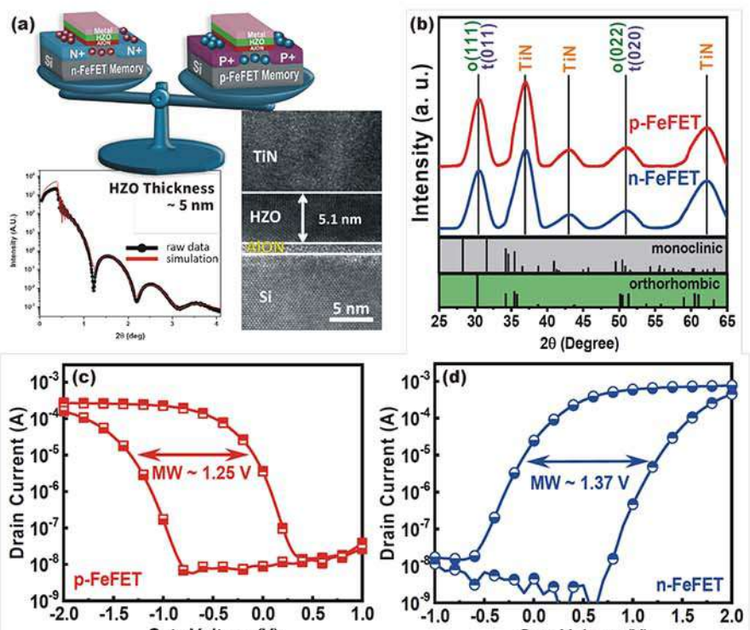

### ● Radiation hardened n- & p-FeFET



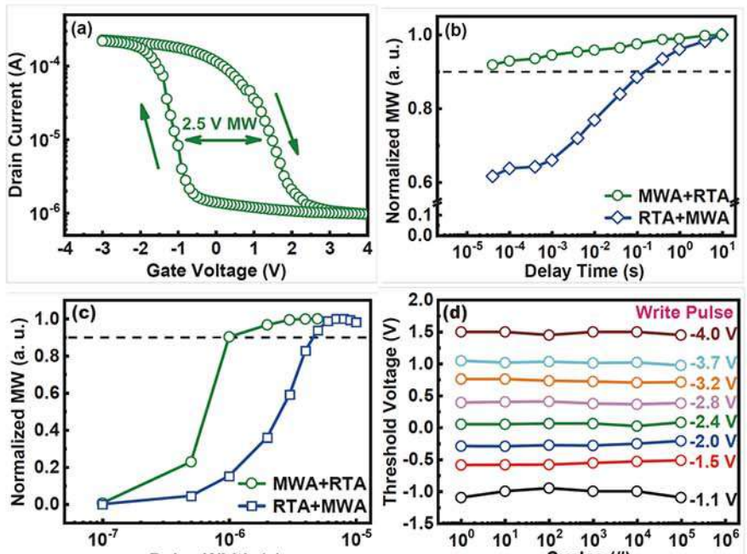

### ● Enhanced Ge-based FeCap by PDA




### ● Symmetric MW in scaled n- & p-FeFET




### ● Ge p-FeFET with hybrid annealing




## 研究生活與心得

感謝中技社對研究成果給予肯定，過去我從未想過會走上博班這條路，只因為有天瞥見布告欄上申請逕讀的公告，抱著試一試的心態誤打誤撞走到現在，現在想想仍像是一場夢。感謝一路上有許多貴人相助，讓我在遇到問題時不會感到孤獨。首先要感謝指導教授-巫勇賢教務長，幾乎無時無刻都能和老師討論研究上的問題以及各種疑難雜症，同時也感謝實驗室過去曾經指導過我的學長姐，除了專業知識外，善良的各位是我加入實驗室很重要的原因，感謝同儕、同一陣線學長和同步輻射中心，是大家的幫忙才能有這些研究成果。另外也感謝期刊的審稿人，大量優質的審查意見讓我能更清楚研究不足的地方。
最後，我想特別感謝我的爸媽和哥哥，讓我在遇到人生亂流時還能有溫暖的避風港，你們的無私奉獻令我非常感動。