



2020「中技社科技獎學金」

2020 CTCI Foundation Science and Technology Scholarship

研究獎學金
Research Scholarship

二氧化矽與皮秒雷射改質之紅銅表面對蒸發與沸騰的影響之研究 Experimental investigation of evaporation and boiling phenomenon on plain and silica-coated copper surfaces textured with picosecond laser



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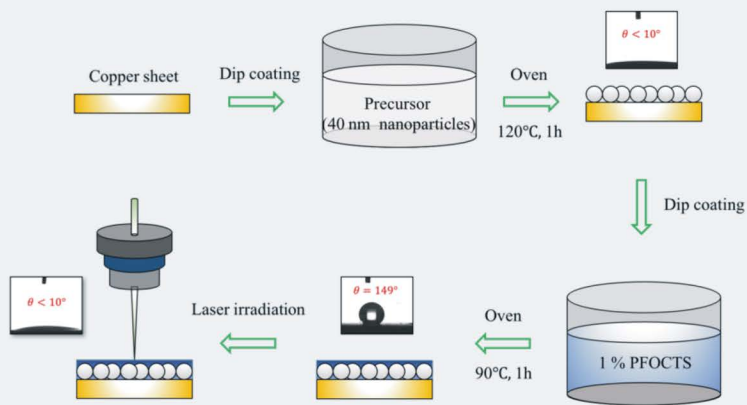
研究重點

This present study focused on effect of the hybrid surface modification method on droplet evaporation and boiling phenomenon. Using picosecond laser system with sol-gel method to modify a copper surface to investigate the issue of surface roughness and surface wettability transition resulting from the change of chemical composition. Understanding the mechanism of the surface characteristics, this hybrid method was further utilized to modify a copper surface to conduct the research of droplet evaporation and boiling experiments. Additionally, a high-speed visualization was used to study the two-phase heat transfer performance by analyzing the bubble dynamics.

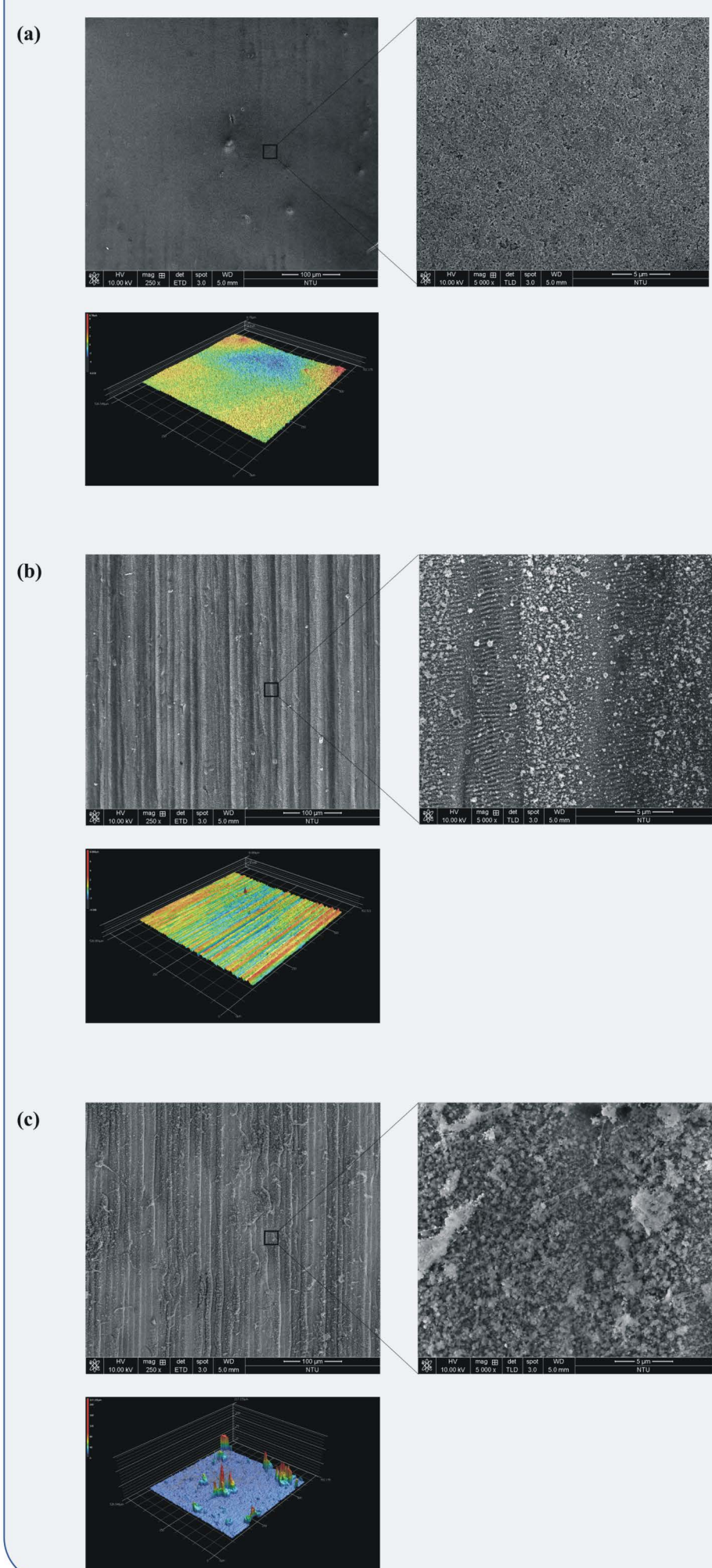
研究成果

Hybrid surface modification

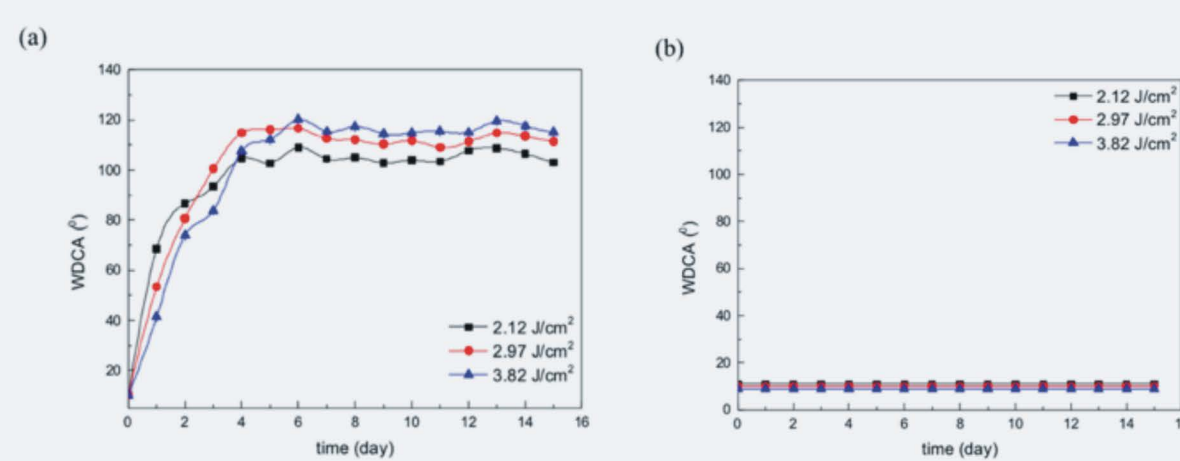
Procedure of surface modification



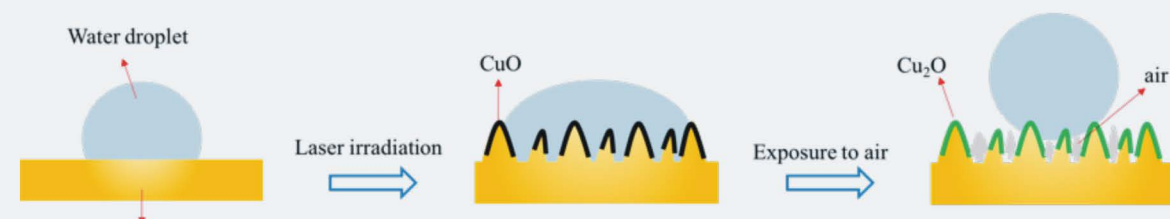
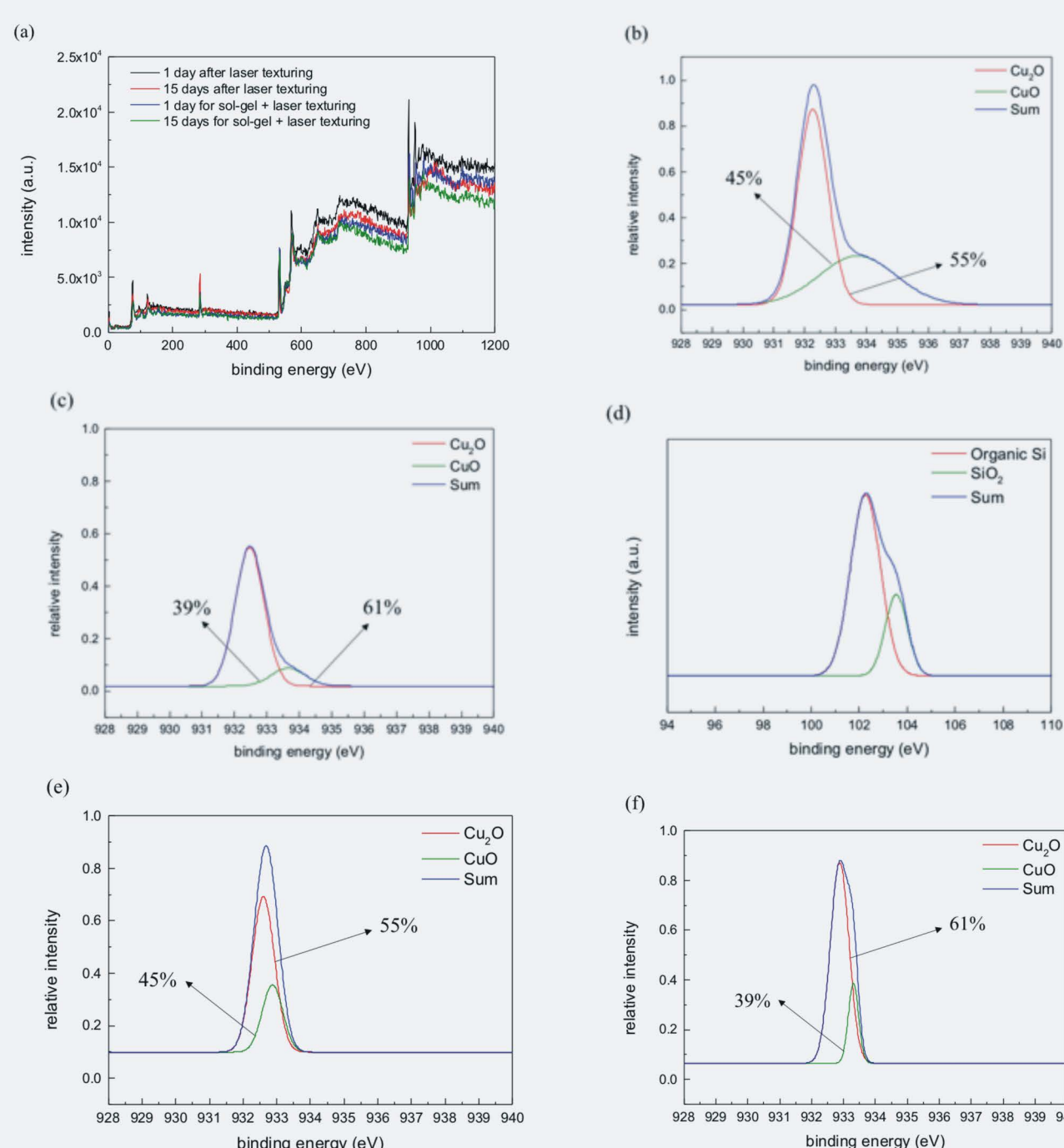
Surface morphology



Wettability transition



Chemical analysis

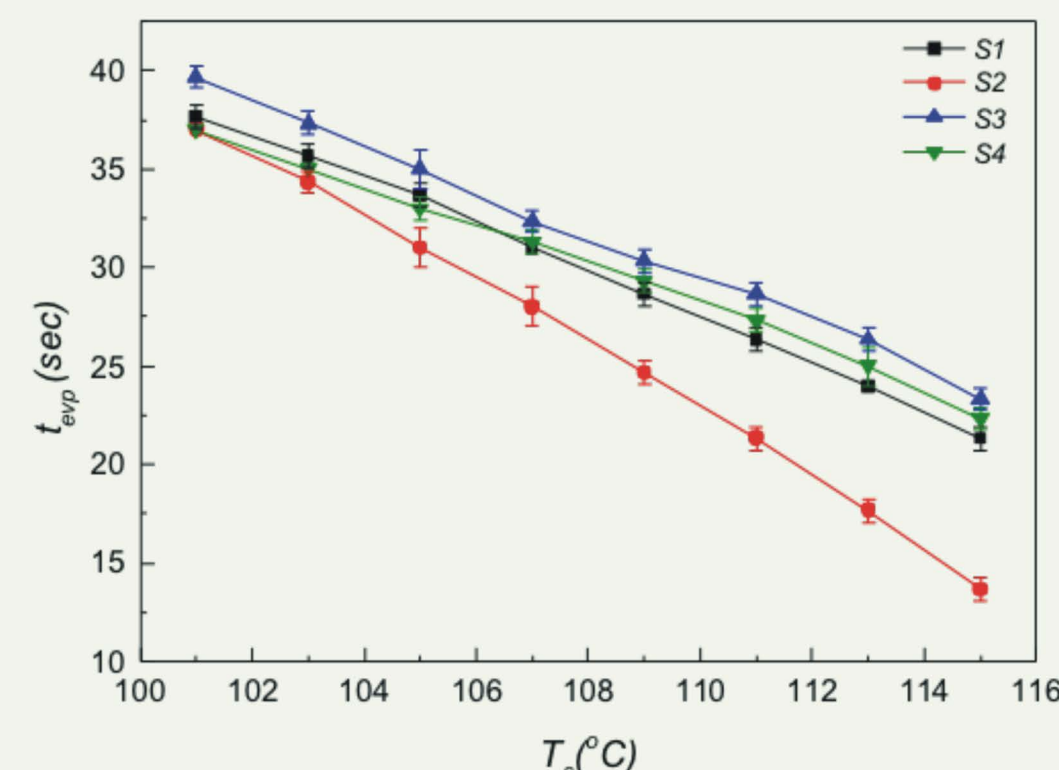


Droplet boiling evaporation

Details of different surfaces

Symbol	Details of surfaces	Surface roughness	Surface wettability
S1	Plain copper surface	$Ra = 0.121 \mu m$	$CA \sim 95^\circ \pm 0.3^\circ$
S2	Laser-textured copper surface	$Ra = 0.164 \mu m$	$CA \sim 125^\circ \pm 0.2^\circ$
S3	Silica-coated copper surface	$Ra = 0.264 \mu m$	$CA < 10^\circ$
S4	Laser-textured silica-coated copper surface	$Ra = 0.356 \mu m$	$CA < 10^\circ$

Overall evaporation time

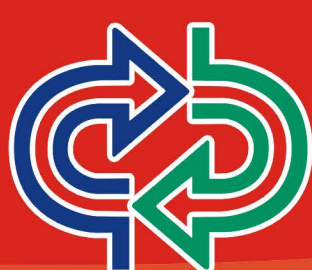


Inner bubble dynamics when $T_s = 111^\circ C$



研究生活及心得

感謝中技社與評審委員們的肯定，此獎對於我在研究領域中的努力是個莫大的肯定。感謝指導教授陳炳輝博士，總是能在每次的討論中不斷給予我指導及意見，讓我有很大發揮空間，使我能心無旁騖的向前邁進。另外感謝實驗室的夥伴們在研究上的討論與協助，以及一直陪伴我的家人，因為有你們的支持，才能成就現在的我。



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