明志科技大學材料工程系106學年四技專題競賽

The synthesis of directly grown CNTs on Stainless Steel mesh to fabricate superhydrophobic/superlipophilic filter membrane

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Introduction

In this study, we successfully synthesized Carbon Nanotubes (CNTs) on Stainless Steel (SS) mesh to fabricate superhydrophobic and superlipophilic filter membrane. Firstly, we used Chemical Bath Deposition (CBD) to deposite $Ni(OH)_2$ film on SS mesh as the catalyst. Subsequently, the sample of $Ni(OH)_2$/SS mesh was placed in our home-made fumace for the growth of CNTs via the chemical vapor deposition (CVD). Different temperatures (450°C、550°C 、650°C) were used in the experiment to investigate the growth and hydrophobic performance of CNTs.
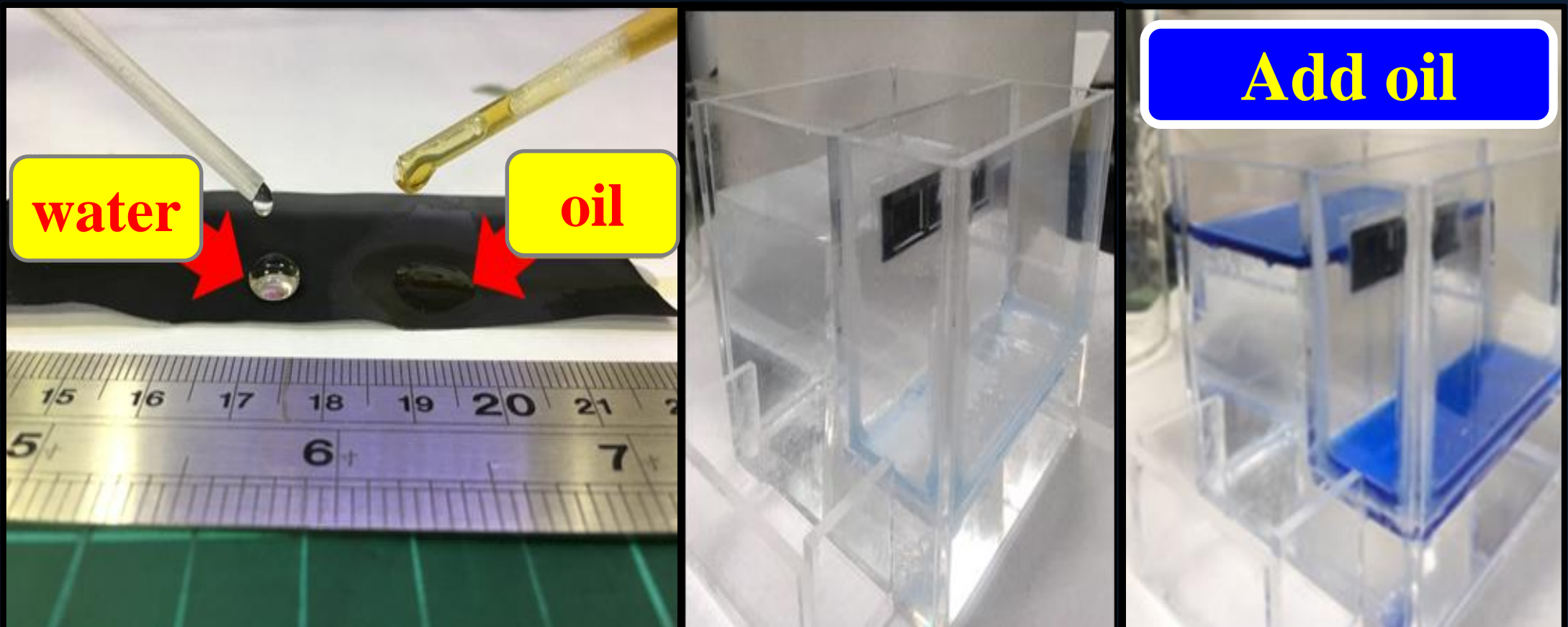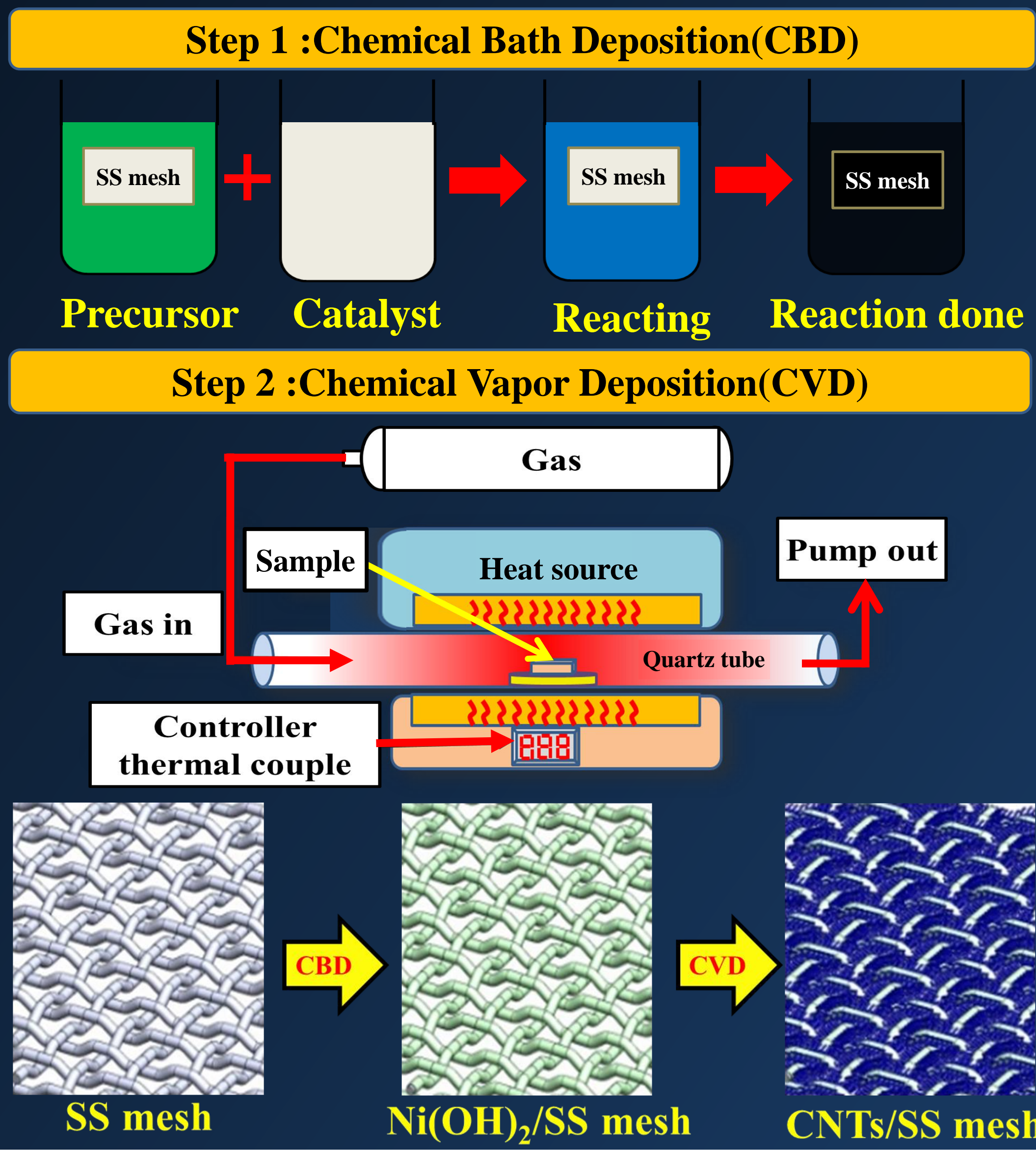

Figure. 1 We successfully produced oil-water separation mesh and installed them in oil-water separation tanks.

Experiemntal steps

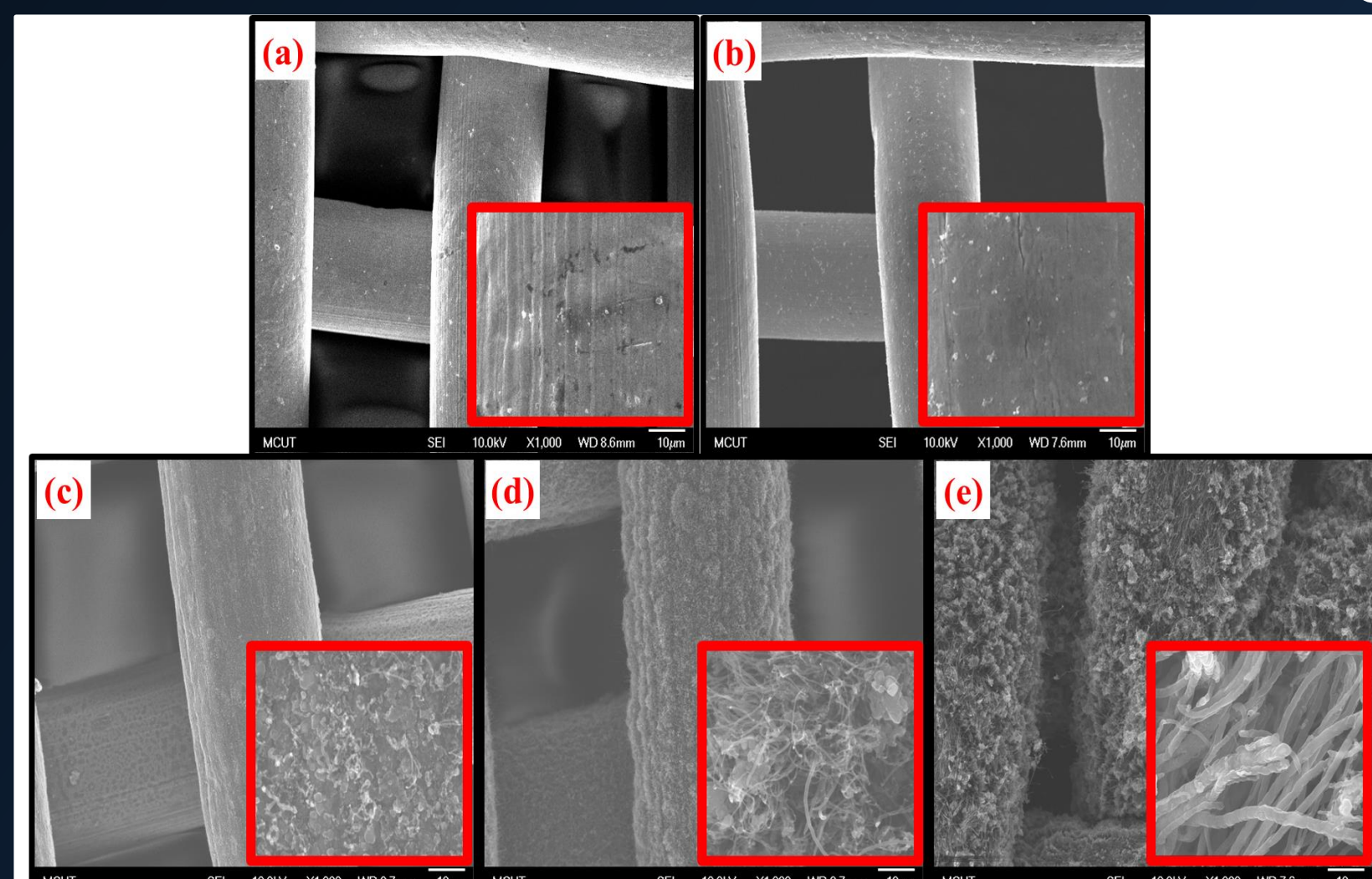Step 1 :Chemical Bath Deposition(CBD)

Precursor + Catalyst → Reacting → Reaction done

Step 2 :Chemical Vapor Deposition(CVD)

SS mesh → CBD → $Ni(OH)_2$/SS mesh → CVD → CNTs/SS mesh

Results

Figure. 2 SEM images of (a) SS mesh , (b) $Ni(OH)_2$ /SS mesh , (c) 450 °C CNTs/SS mesh , (d) 550 °C CNTs/SS mesh , (e) 650 °C CNTs/SS mesh.
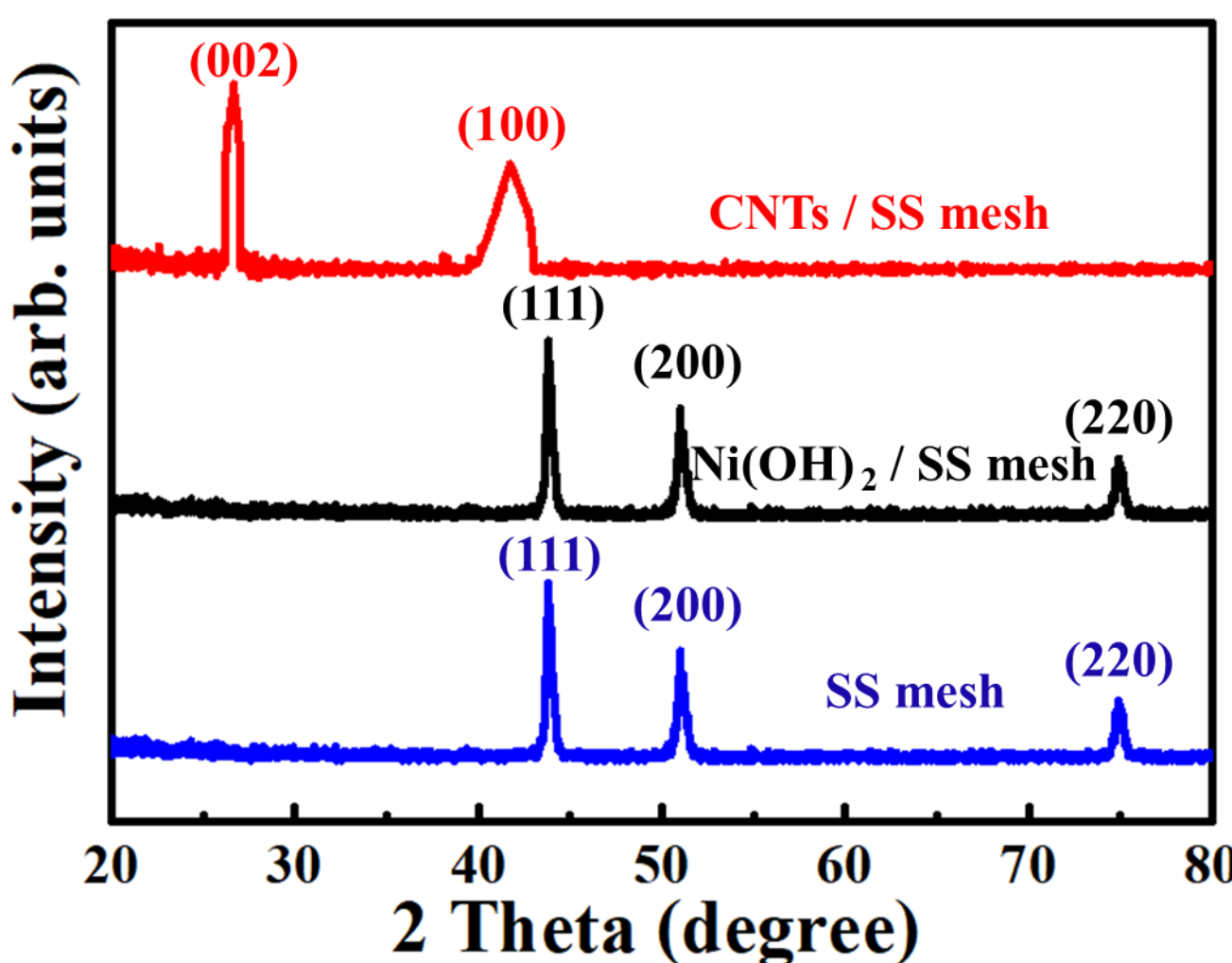

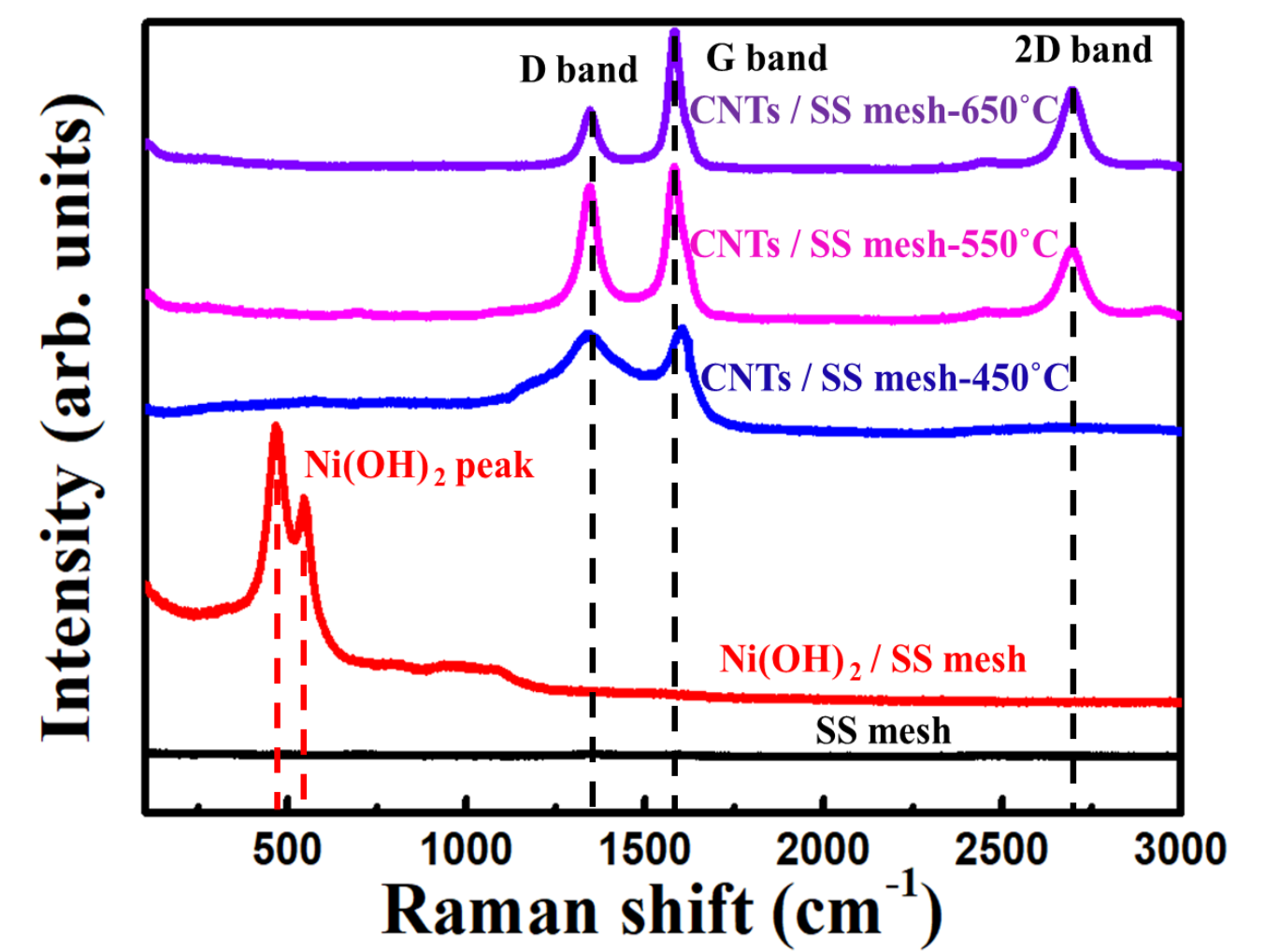Figure. 3 XRD results of CNTs/SS mesh at various temperatures.

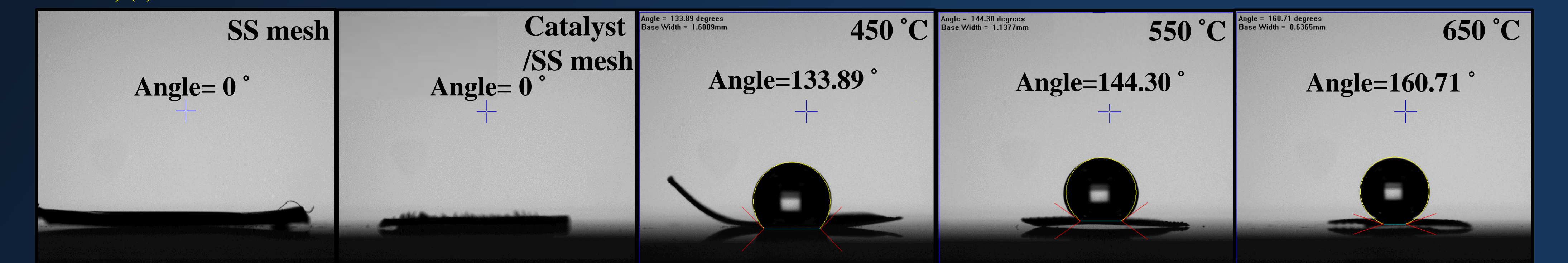Figure. 4 Raman results of CNTs/SS mesh at various temperatures.

Figure. 5 Contact angle of CNTs/SS mesh grown by various temperatures.

Conclusion

◆ CNTs grow at 650°C show the best behavior of hydrophobicity.
◆ The direct growth of CNTs own the outstanding adhesion with SS mesh, we successfully fabricate superhydrophobic, high-strength, and anti-corrosion filter membrane for oil-water separation.
◆ CNTs/SS mesh show the excellent performance in oil-water separation.