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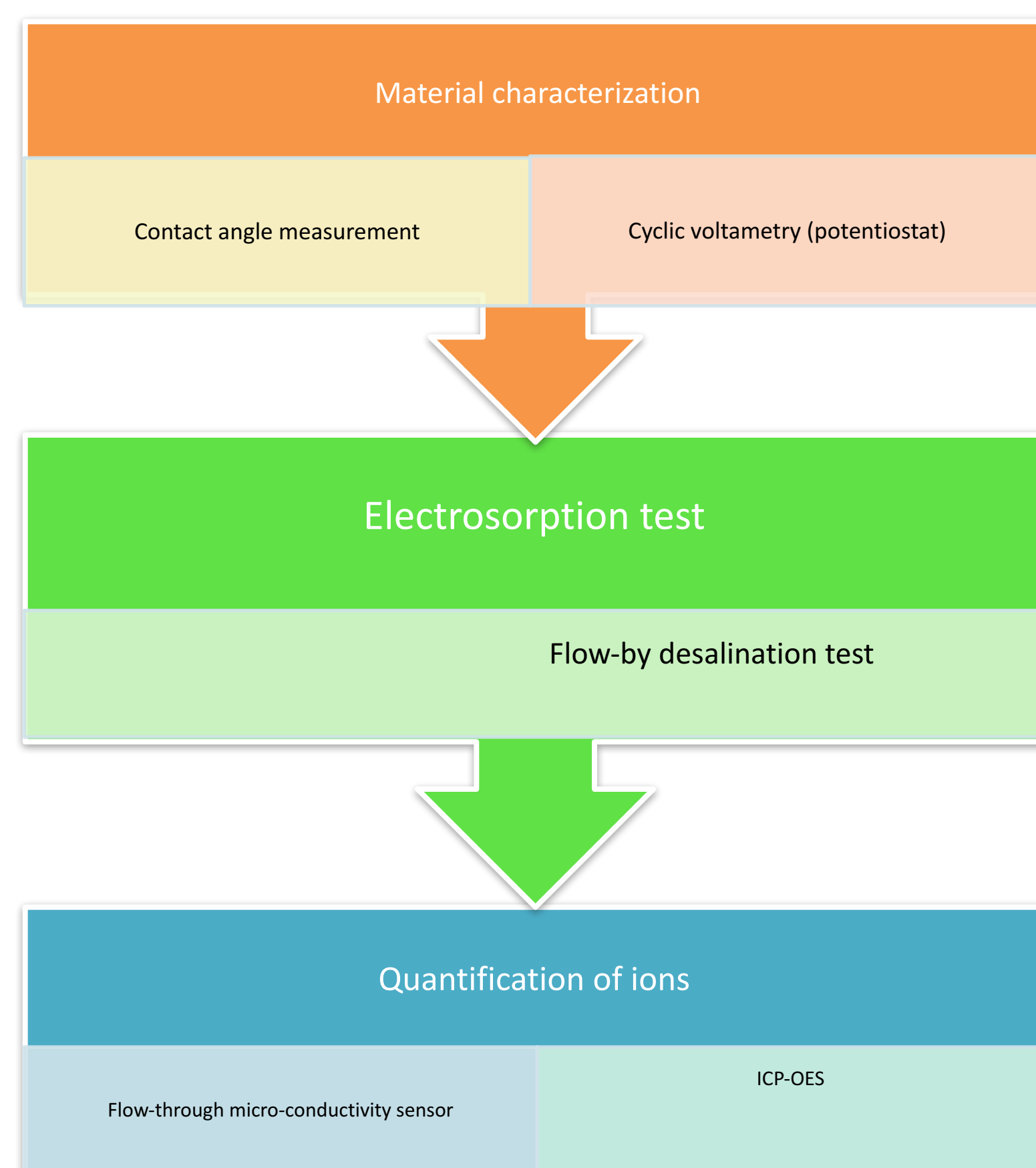
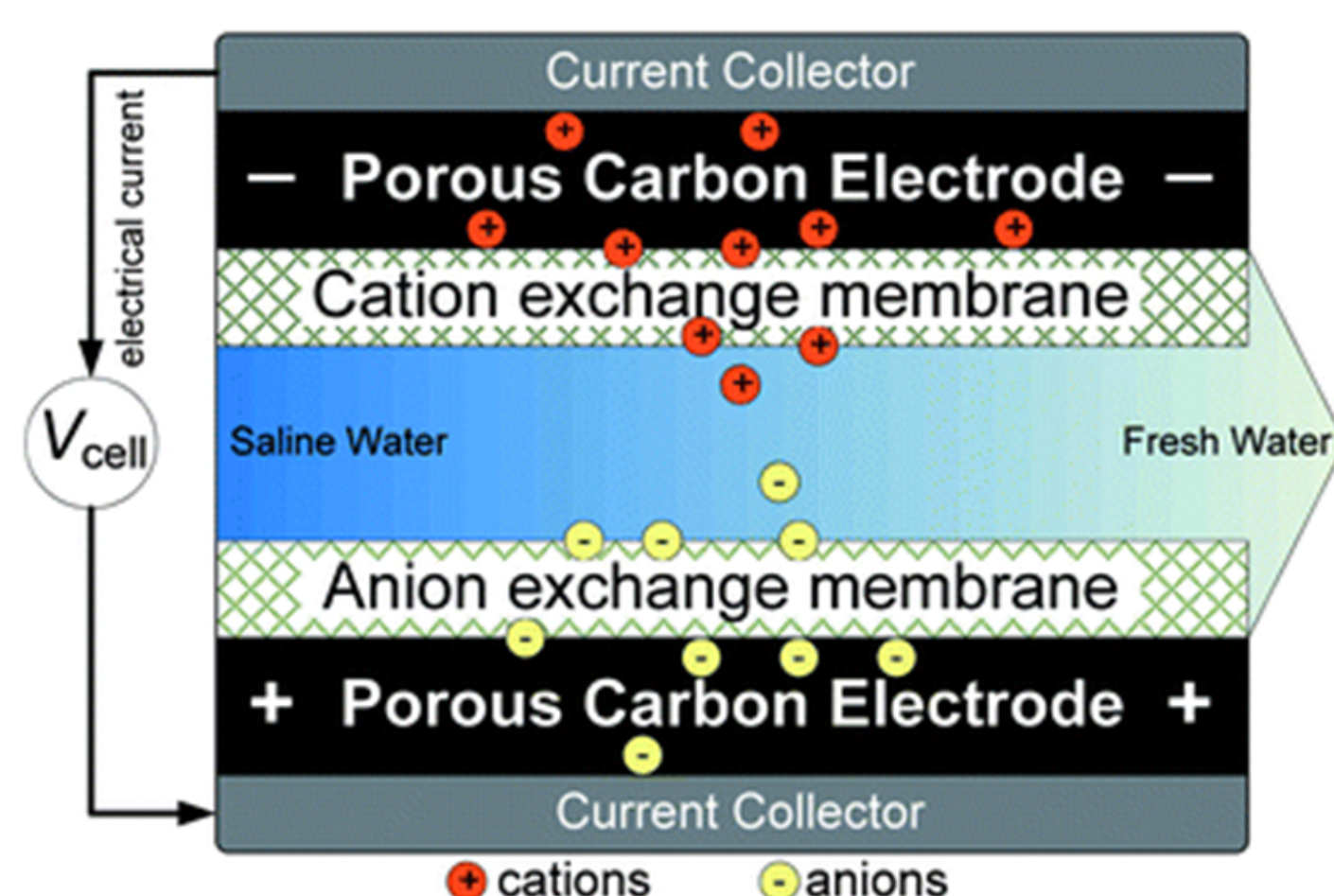
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Engineering, Rice University ,4 Nanosystems Engineering Research Center for Nanotechnology-Enabled Water Treatment (NEWT)

Research Background

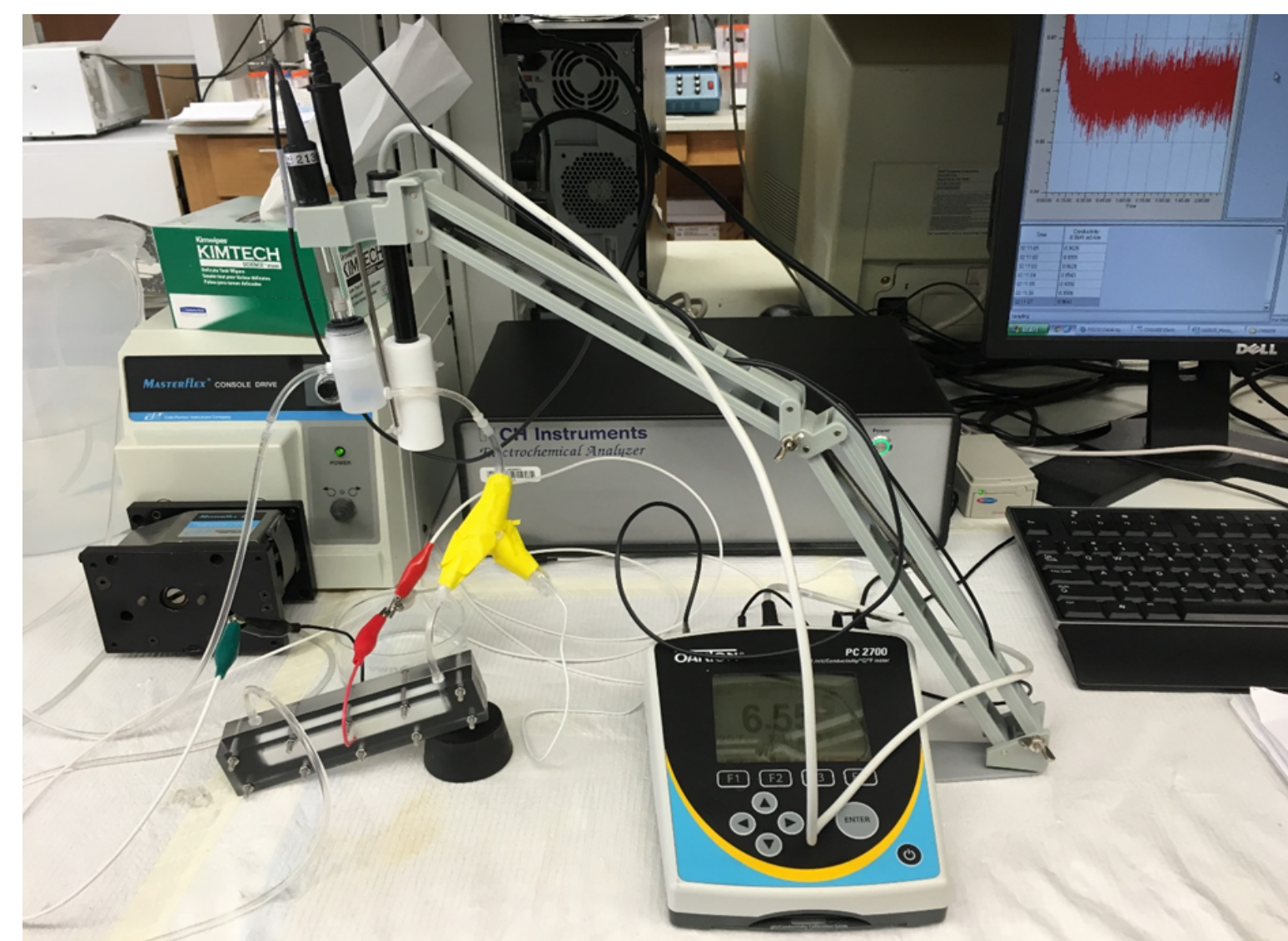
In order to increase the fresh water supply, **capacitive deionization (CDI)** technology has been identified as a promising energy-efficient desalination technology removing salts from aqueous solutions.

Material and Methods

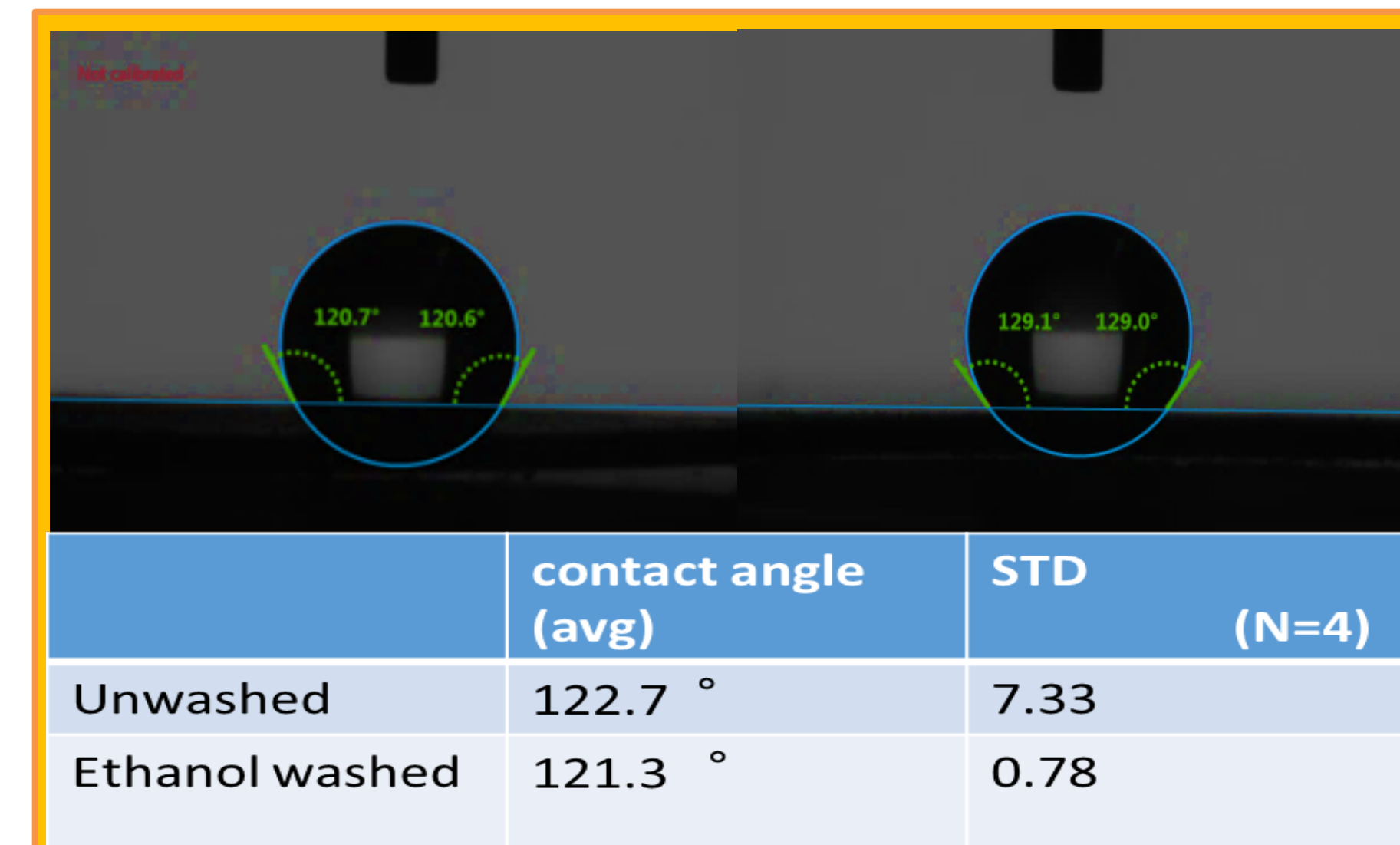
• The basic mechanism of CDI₁



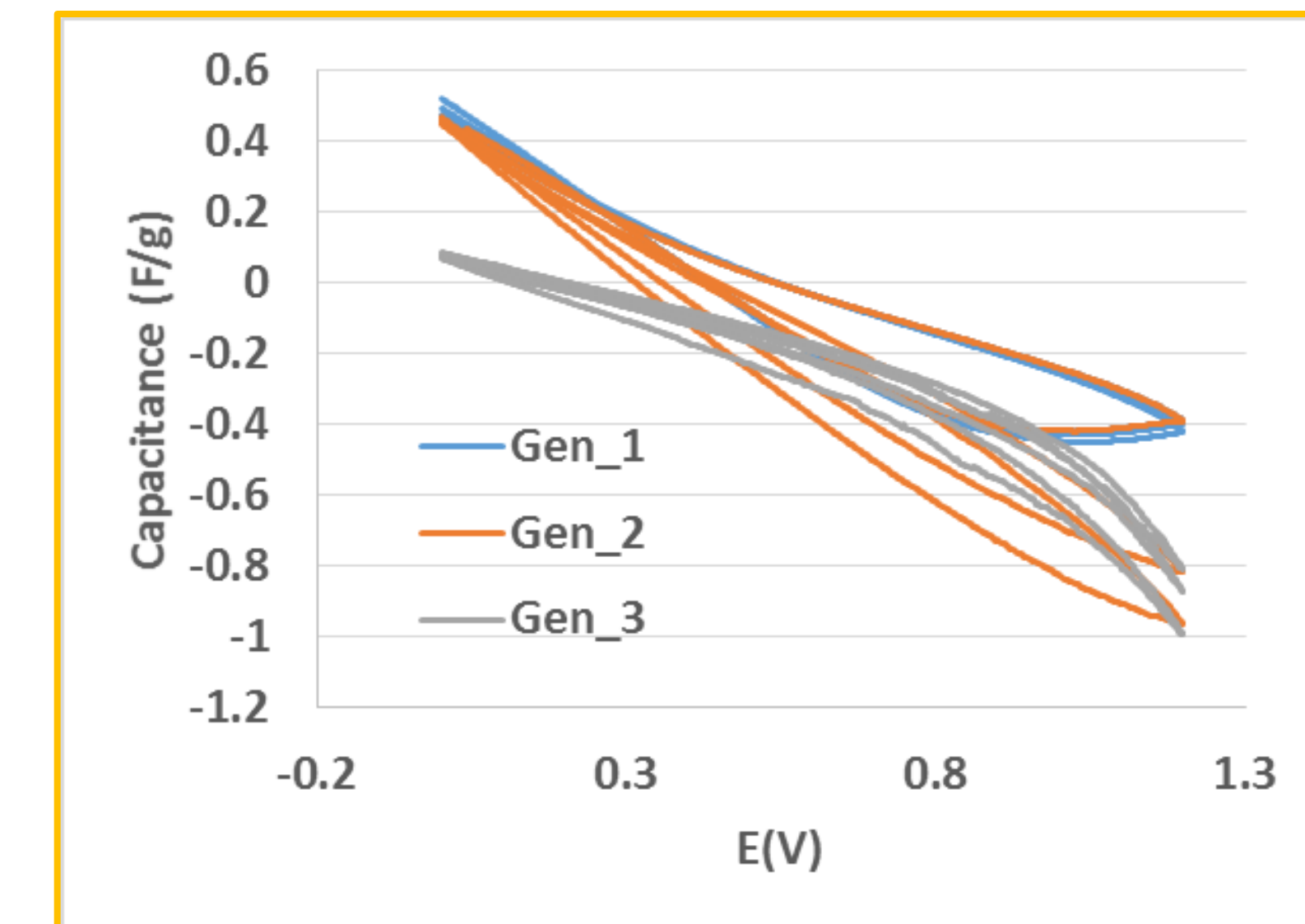
Result and Discussion



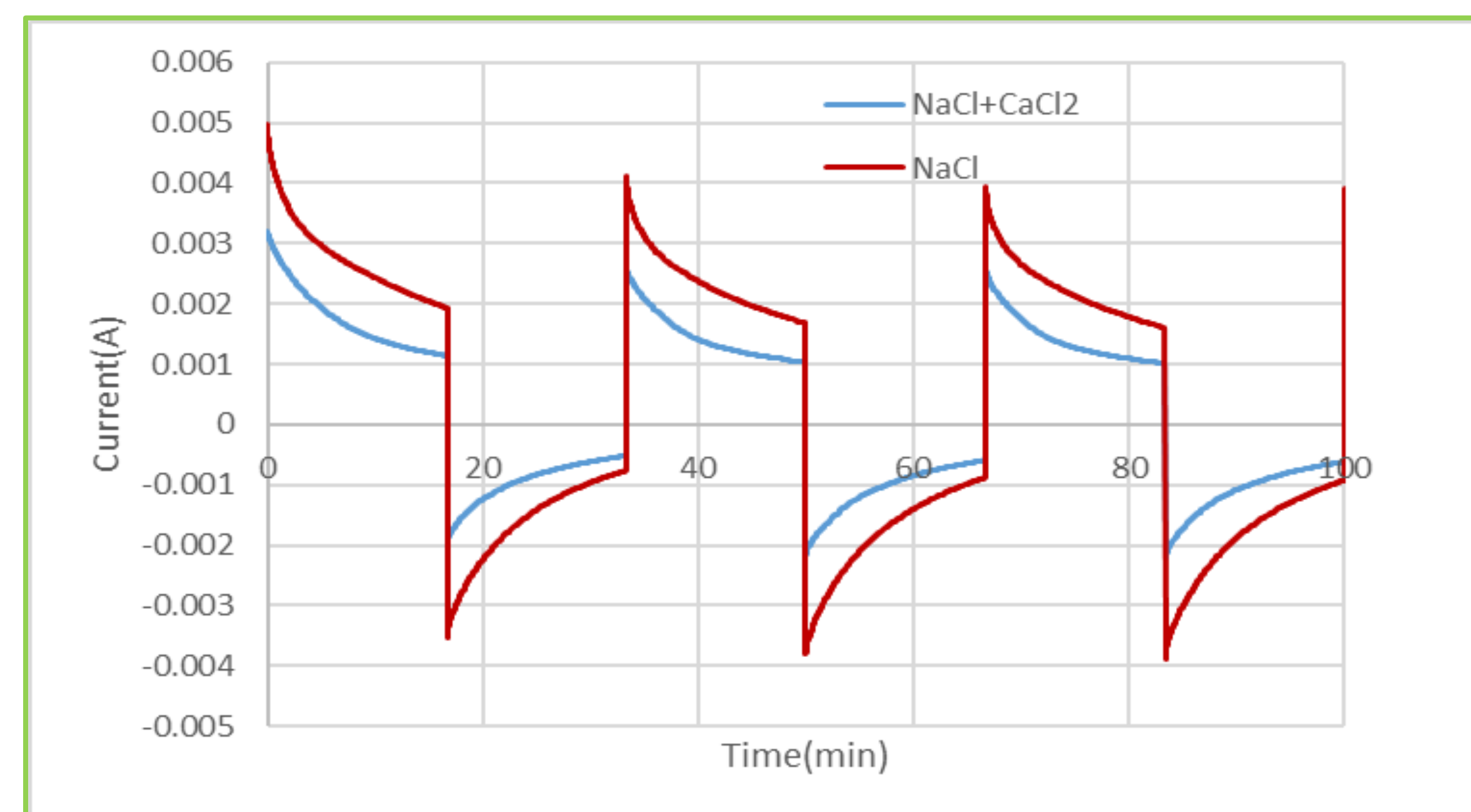
Electrosorption experiment



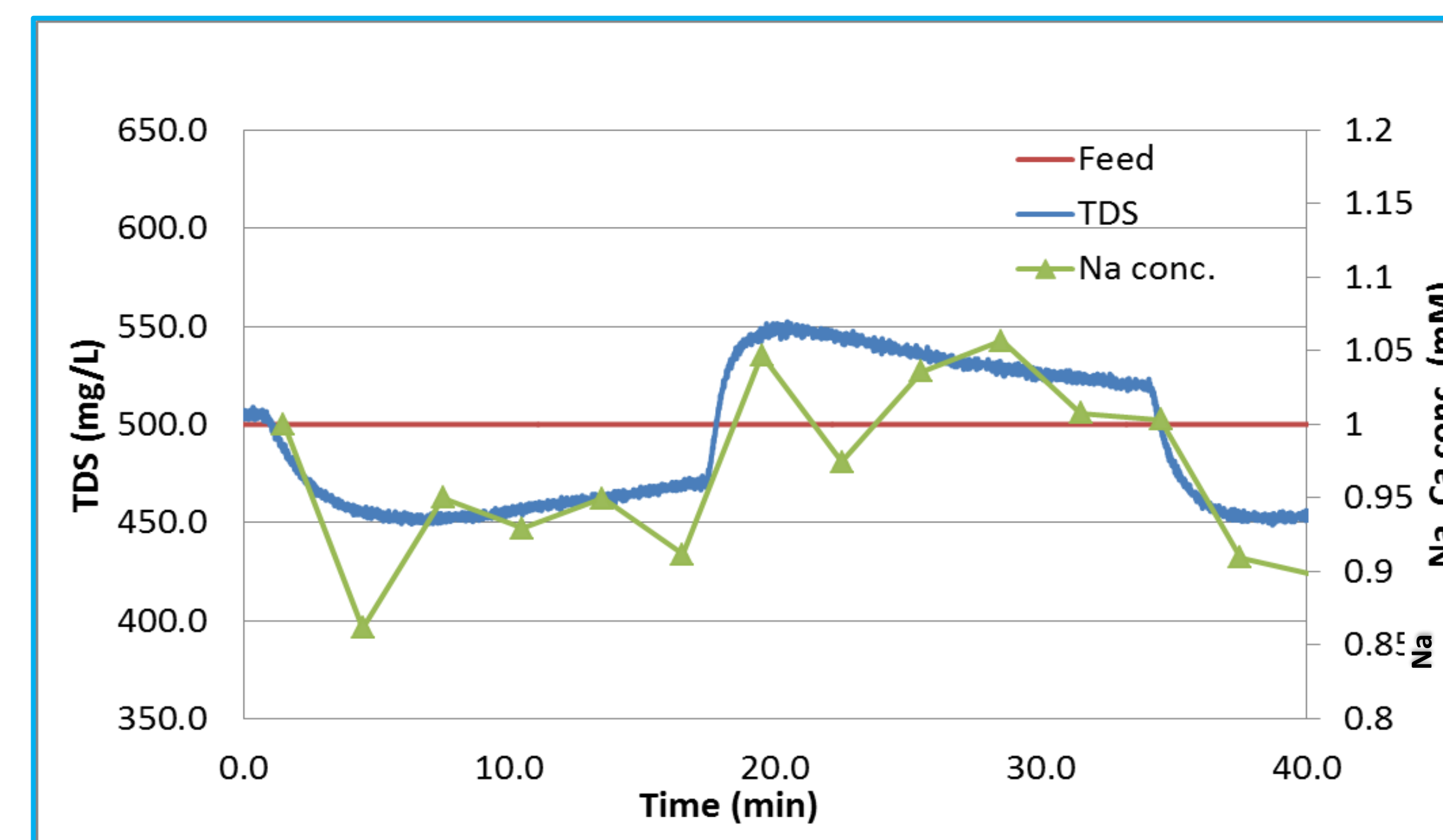
Contact angle measurement (hydrophobic)



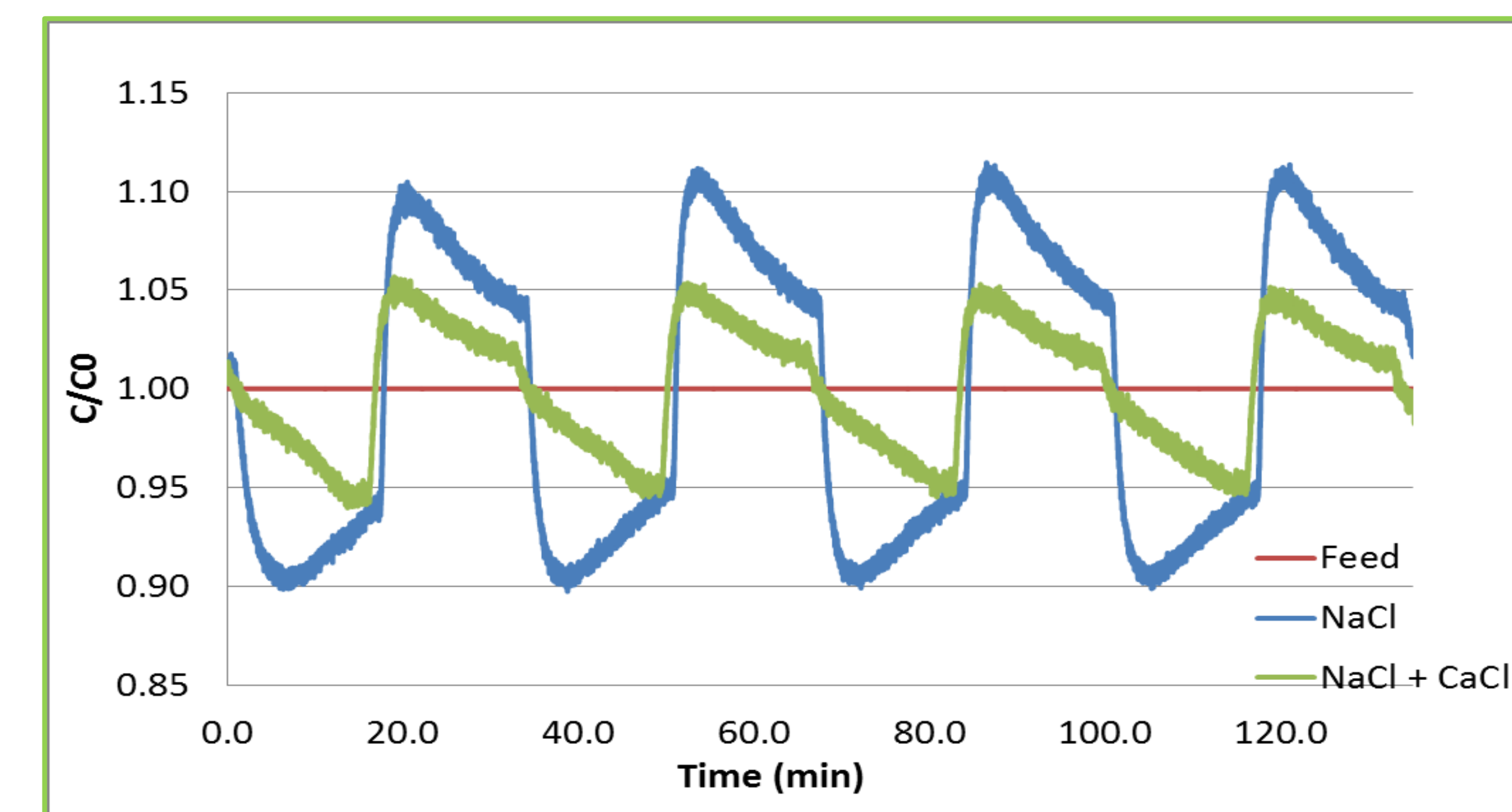
Cyclic voltammetry (two-electrodes)



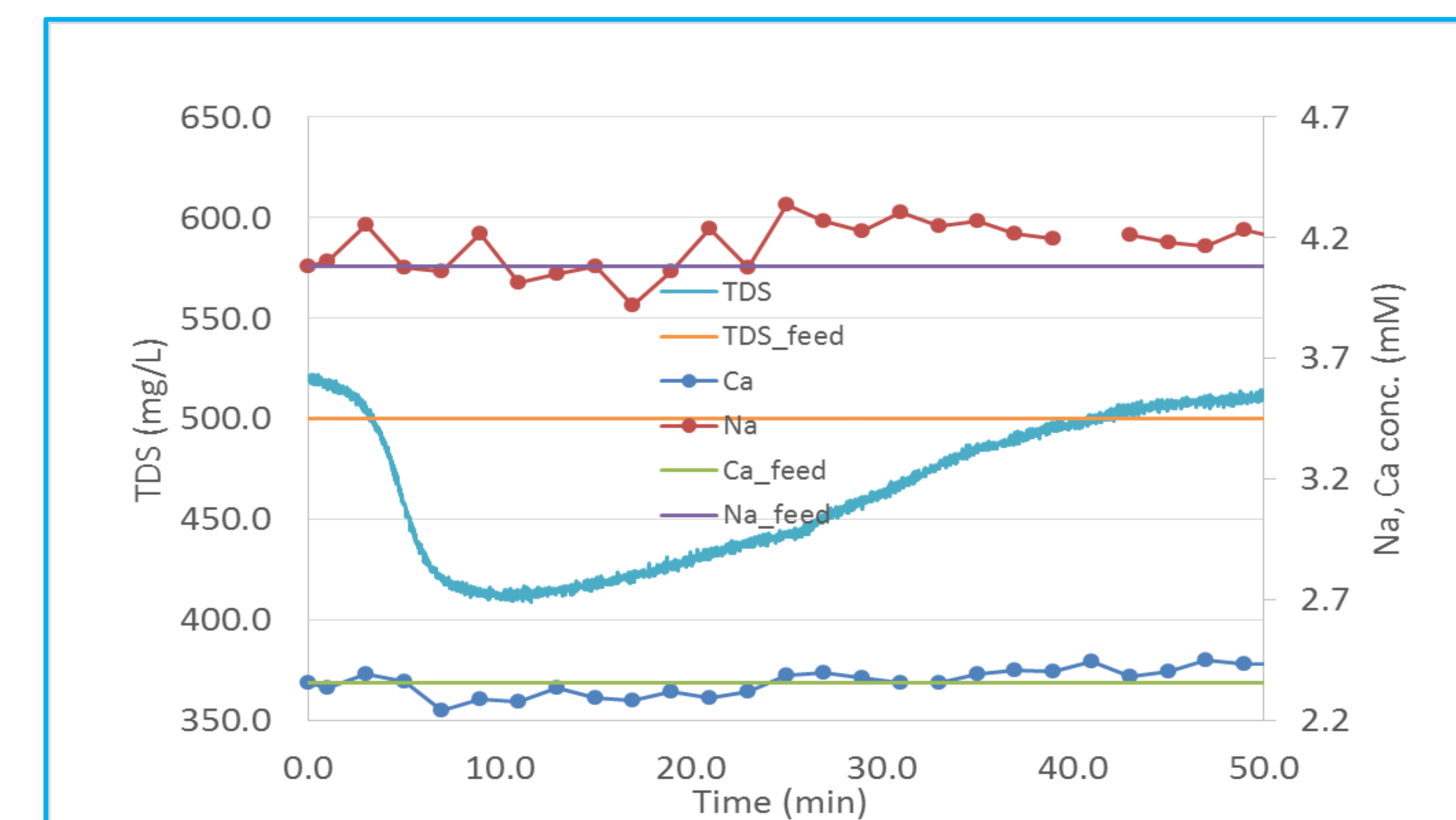
	SAC (mg/g)	ASAC (mg/g/min)	MSAR (mg/g/min)
NaCl	4.57	0.27	0.38
NaCl+CaCl2	1.75	0.11	0.21



• Samples are taken by each 3 minutes from the 3rd cycle.
#The absorption of Na⁺ ions is following the electrodesorption / regeneration cycles.



• Desalination test at constant voltage 1.2V.
• Current used for electrodesorption was within 0.005 A range.
• More salt was removed (in terms of conductivity) on mono (Na only) solution was used as feed.



Electrodesorption / regeneration cycle for mixture feed water costs more time than NaCl solution.
Na⁺ and Ca²⁺ ions are not distinctively reduced much during the adsorption period.

Conclusion

- The carbon electrode is hydrophobic even after Ethanol washed.
- CDI system can remove salt from water efficiently.
- The electrosorption is a **reversible process**.
- The regeneration can be achieved by discharging Activated Carbon electrodes.

Future Work

- Modified experiment method to identify time-dependent ion-selectivity and regeneration process.
- Applying higher capacitance carbon nano-materials for the CDI electrodes.

reference

1. R. Zhou, P. M. Biesheuvel, and A. van der Wal, Energy & Environmental Science, vol. 5, 2012.
2. C.H.Hou, C.Y.Huang, C.Y.Hu, Application of capacitive deionization technology to the removal of sodium chloride from aqueous solutions, vol.10:753-756, 2013.

Acknowledgement

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For more information, please visit <http://nakatani-ries.rice.edu/>.
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