



Biosensors Derived from Copolymers of Vinylferrocene with Various para Substituted Phenylmaleimides - Nawrah Alghamdi , Ashlyn Conner, & Charles J. Neef*

Chemistry Department, Pittsburg State University, Pittsburg, KS 66762
cneef@pittstate.edu, 620-235-4494

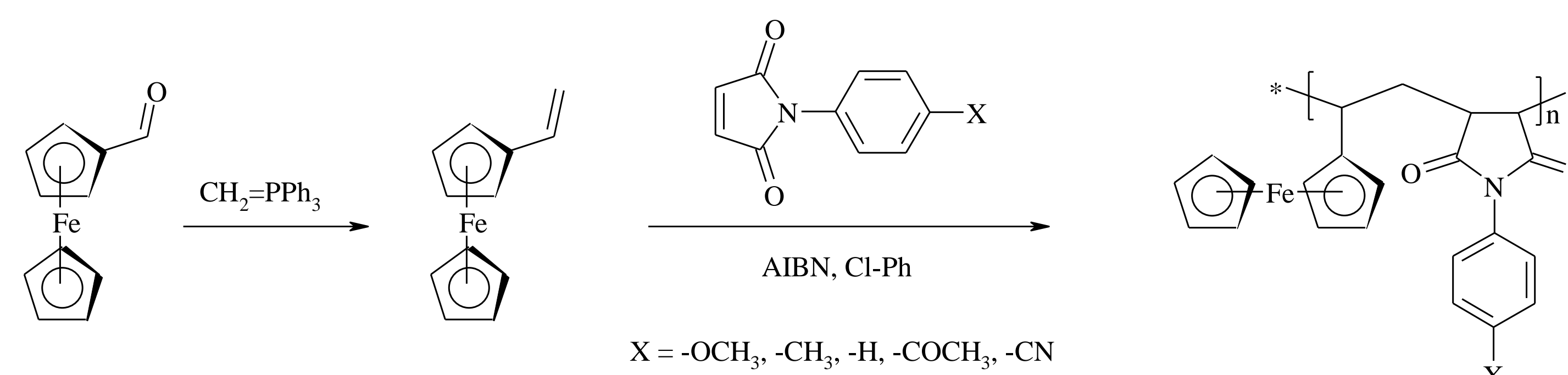
Introduction

- Ferrocene containing polymers have stable redox properties which make them attractive for various applications such as biosensors¹, energy storage², and as catalyst³.
- Ferrocene polymers have shown promise as electrochemical mediators in biosensor applications⁴.
- In this research work, we focused on the structure/property relationship of alternating copolymers of various para substituted phenylmaleimides with vinylferrocene.

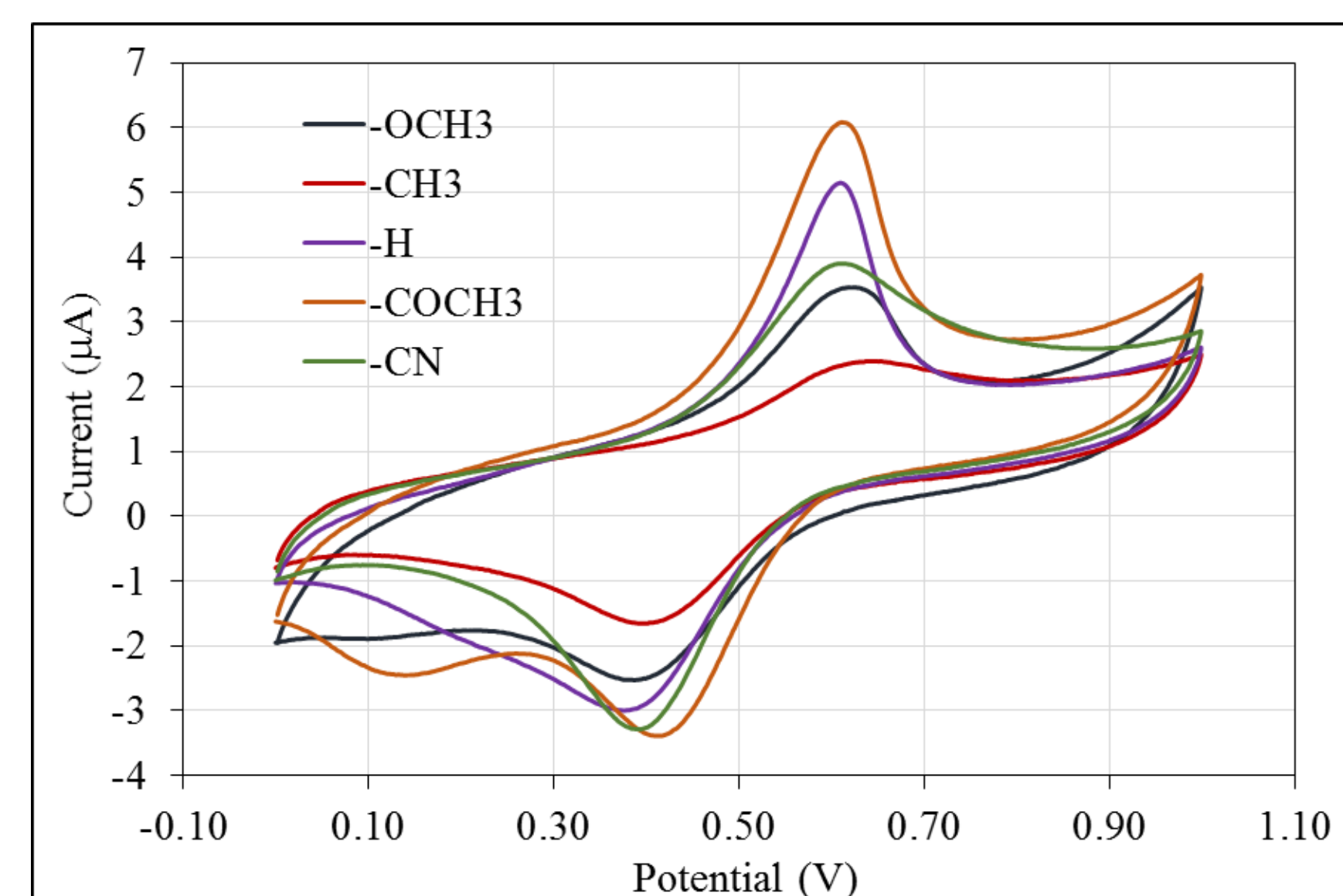
Experimental

- All starting materials were commercially available unless otherwise stated.
- Polymers were synthesized according to literature procedure.⁵
- Electrochemical experiments were carried out using a Gamry Interface 1000 potentiostat .
- A standard three electrode setup was used with a Pt working and counter electrodes with a pseudo Ag or Ag/AgCl reference electrode.
- Bu₄NPF₆ or NaCl was used as the supporting electrolyte, at a concentration of 0.1 M.

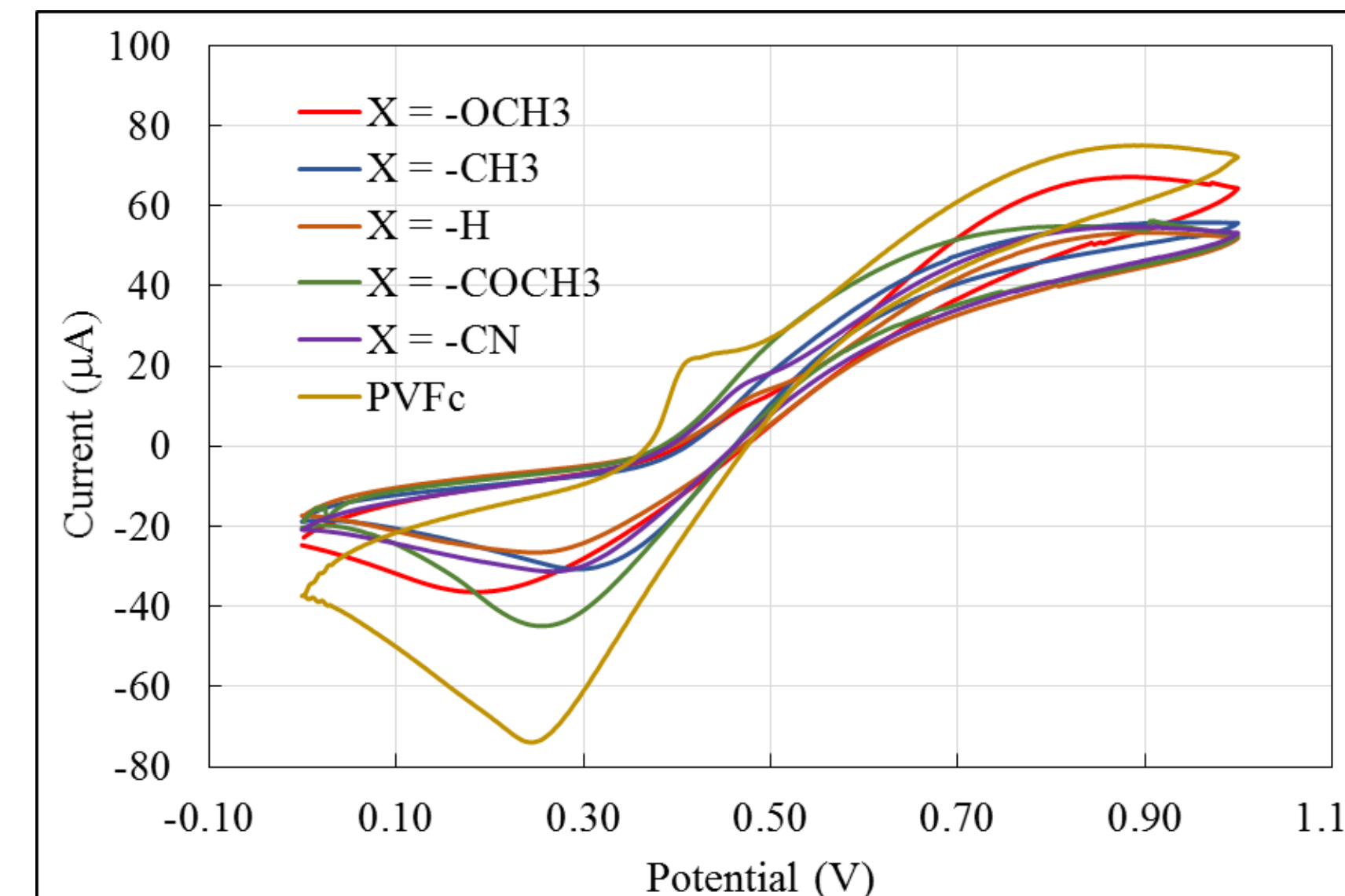
Synthesis of Materials



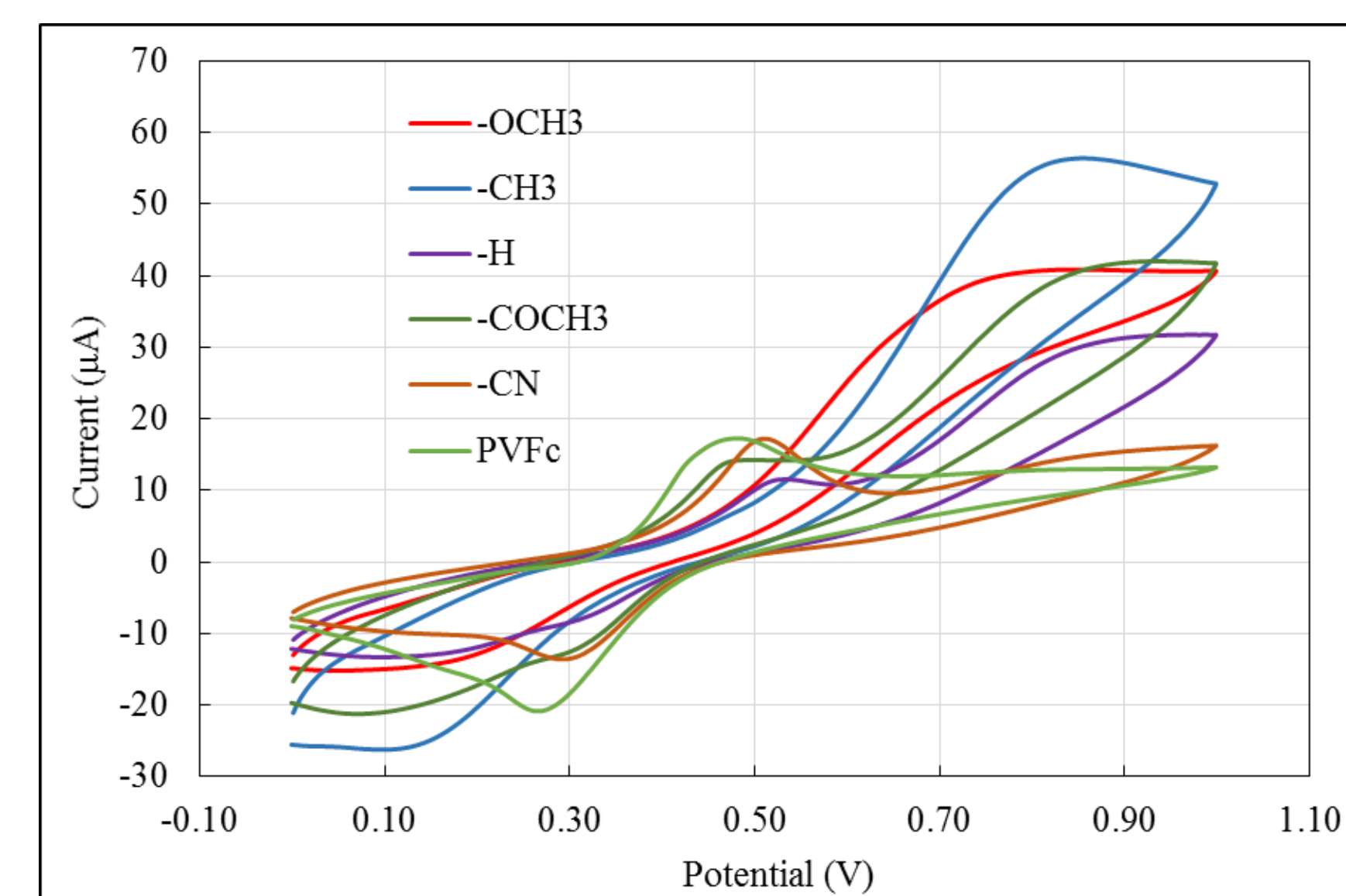
CVs of Polymer Thin Films in H₂O



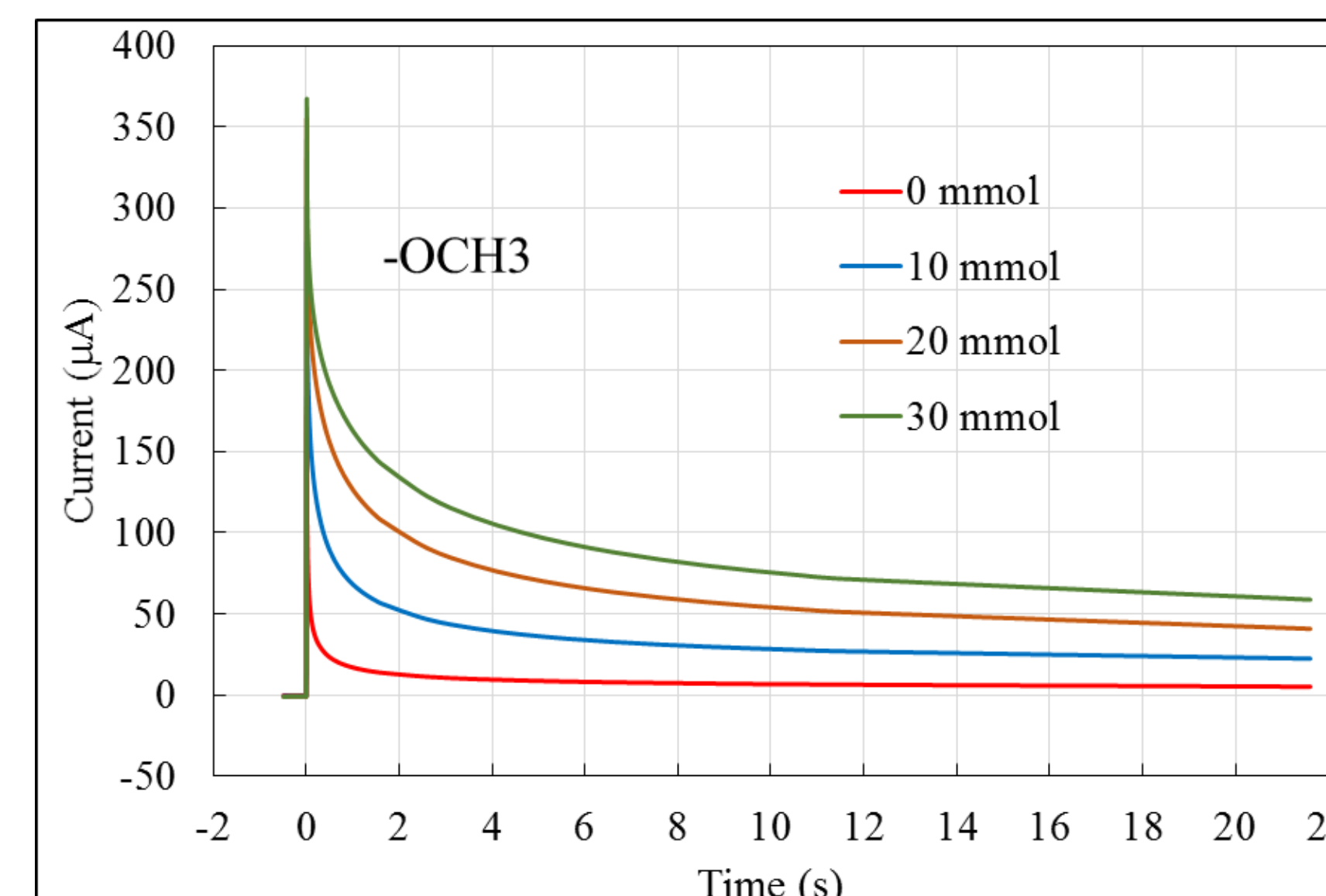
CVs of Materials with 0.75 mM H₂O₂



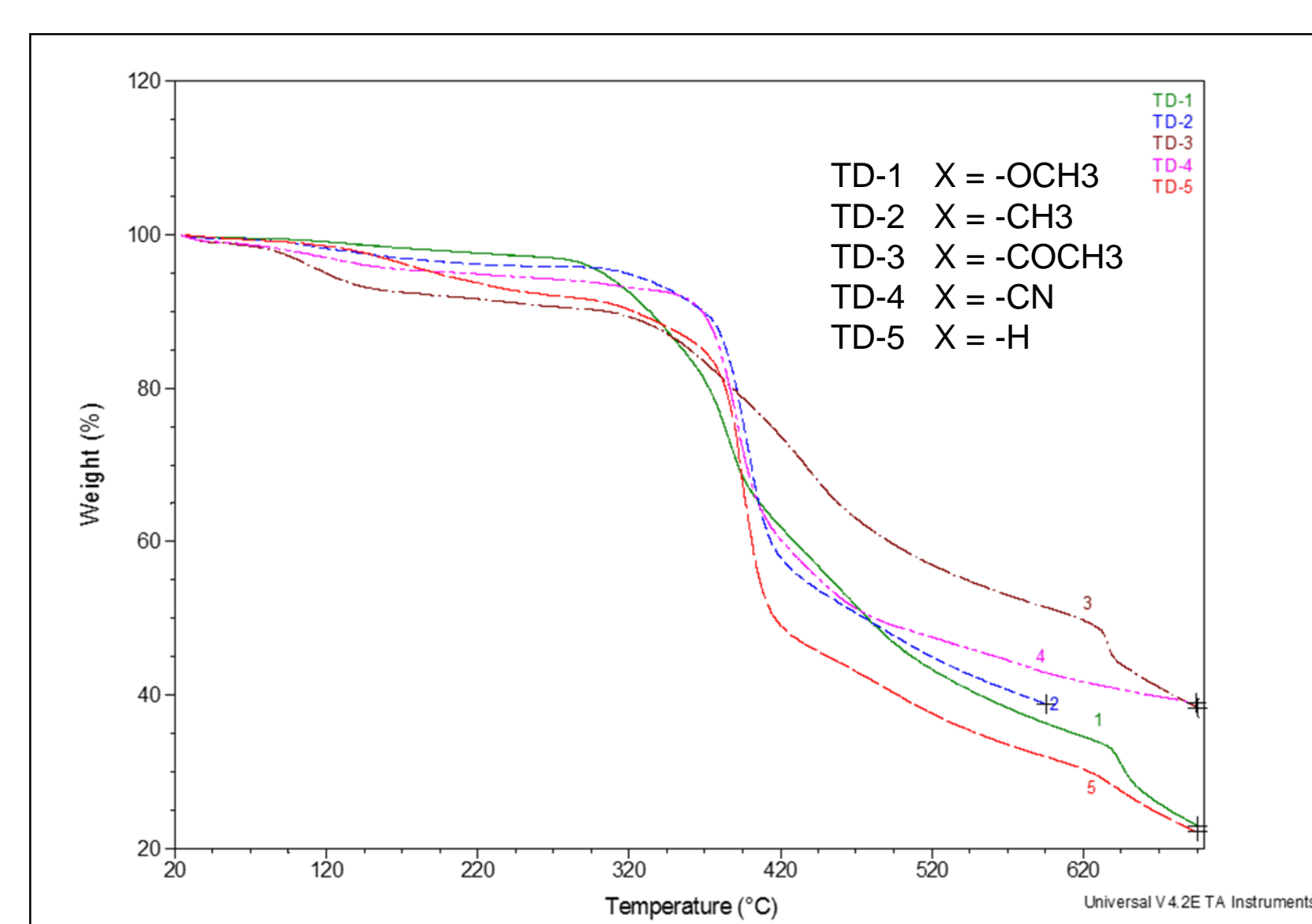
CVs of Polymers with Dopamine



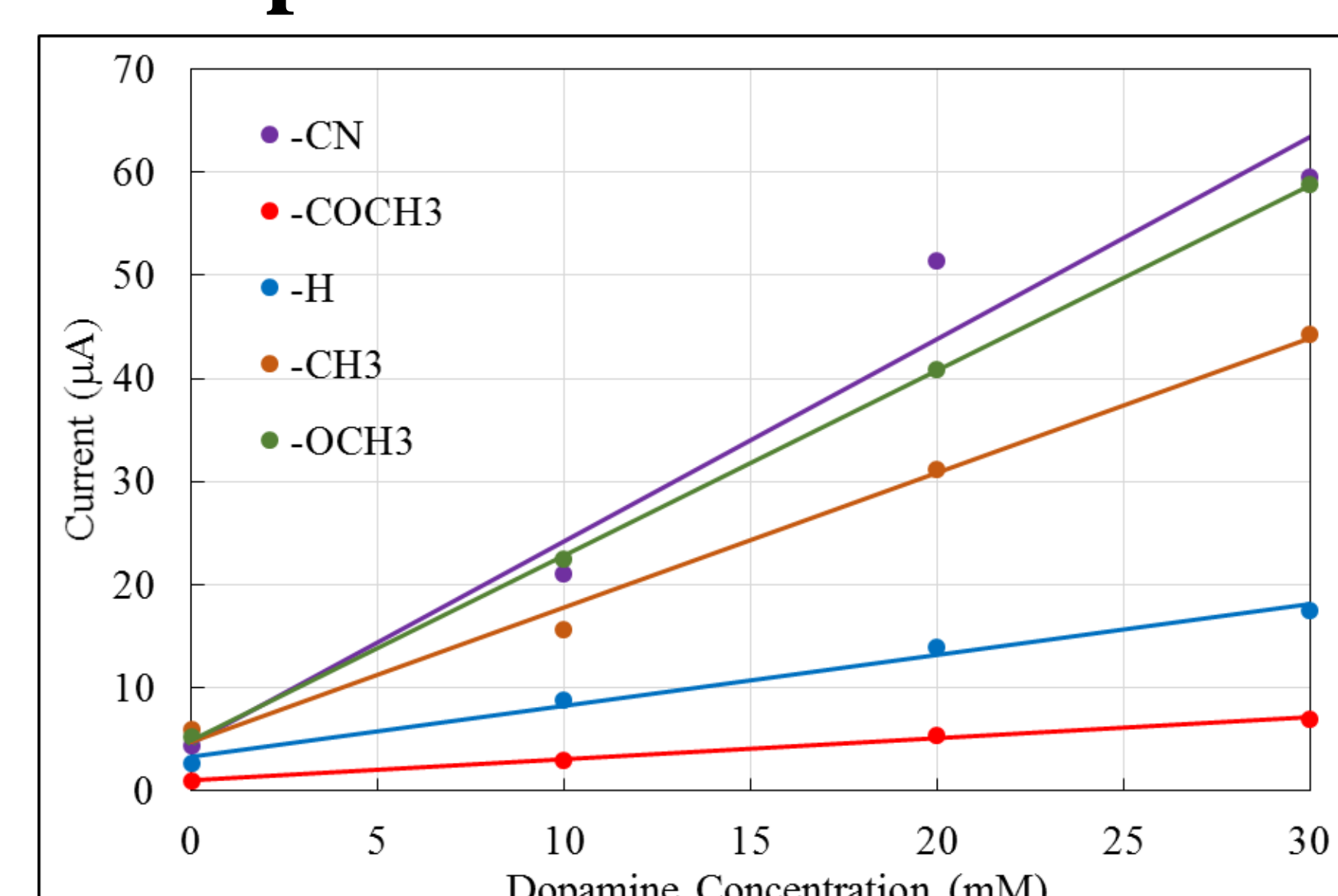
Polymer (OCH₃) with Dopamine



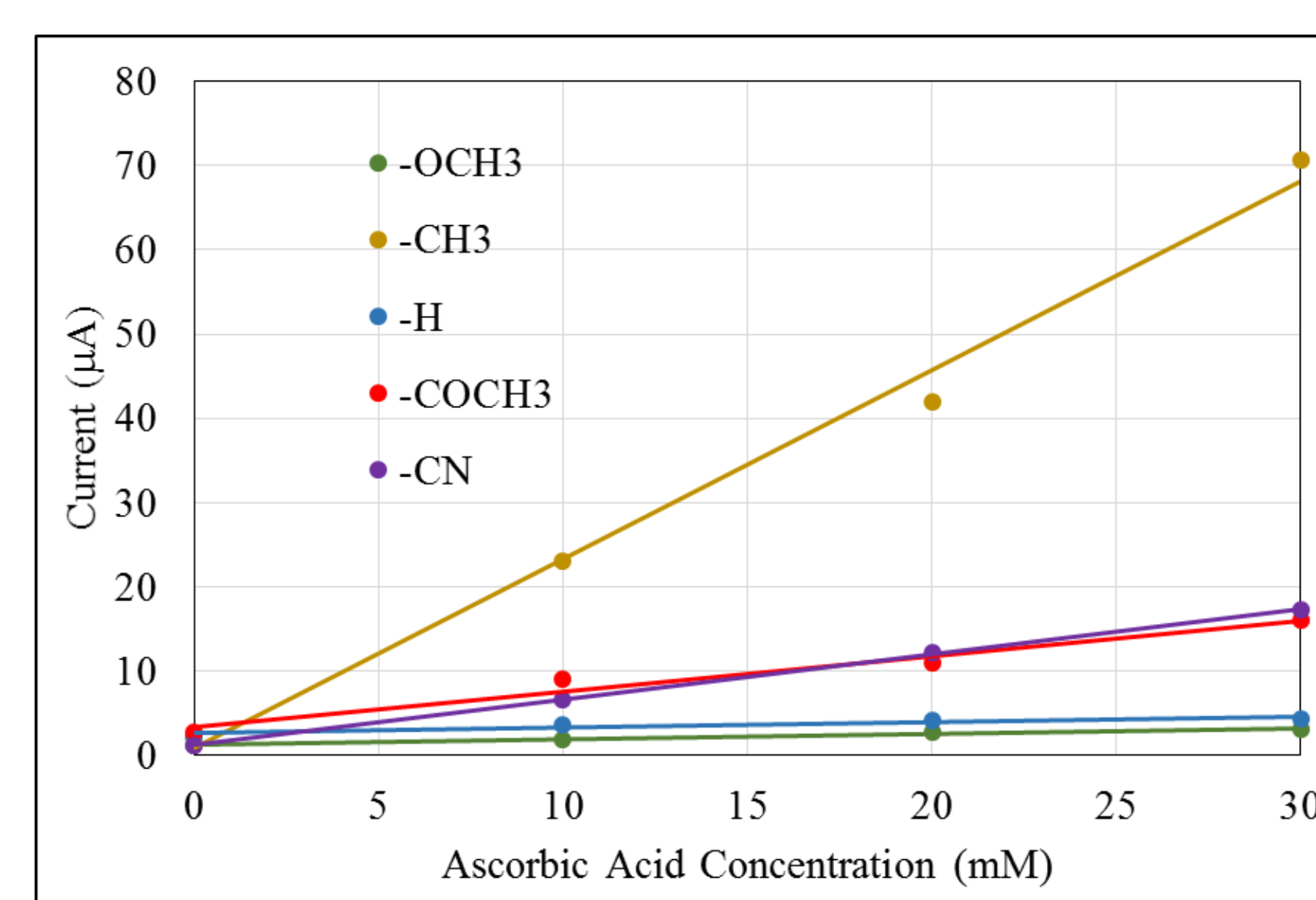
Thermal Stability of Polymers



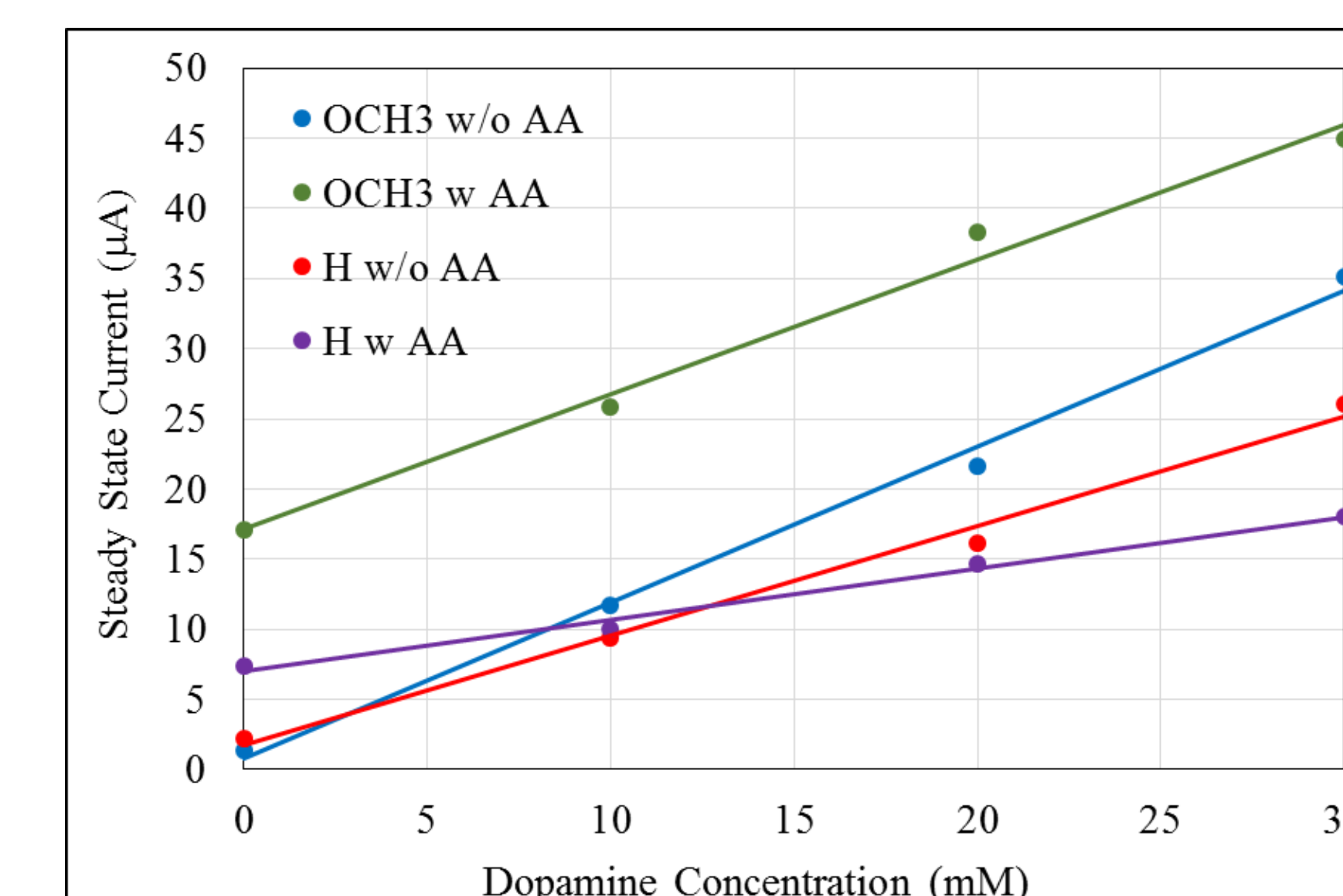
Steady State Current vs. Dopamine Concentration



Steady State Current vs. Ascorbic Acid Concentration



Steady State Current vs. Dopamine Concentration with and without Ascorbic Acid



Conclusion

- Copolymers from vinylferrocene and various para substituted N-phenylmaleimides have been synthesized.
- Each polymer exhibited good redox activity in water.
- Copolymers did not show good sensitivity to peroxide.
- Polymer containing the methoxy substituent exhibited good sensitivity to dopamine and little interference to ascorbic acid when tested individually.
- However, ascorbic acid showed significant interference when combined with dopamine.

References

- Chen, J., Too, C. O., Wallace, G. G., & Swiegers, G. F. *Electrochimica Acta*, **49**(5), 691–702 (2004)
- Jureviciute, I., Bruckenstein, S., & Hillman, A. R. *Journal of Electroanalytical Chemistry*, **488**(1), 73–81 (2000)
- Chen, J., Burrell, a. ., Collis, G. ., Officer, D. ., Swiegers, G. ., Too, C. ., & Wallace, G. *Electrochimica Acta*, **47**(17), 2715–2724 (2002)
- Losada, J. Garcia, M. Cuadrado, I. Alonso, B. Gonzalez, B. Casado, C. Zhang, J. *Journal of Organometallic Chemistry* **689**(17), 2799–2807 (2004)
- J. Carberry, J.A. Irvin, D.T. Glatzhofer, K.M. Nicholas, and C.J. Neef *Reactive and Functional Polymers*, **73**, 730–736 (2013)

Acknowledgments

We would like to thank Pittsburg State University for financial support of this project.