

Pittsburg State University

## Pittsburg State University Digital Commons

---

Posters

2022 Virtual Research Colloquium

---

1-1-2022

### Electrochemical properties of MOF-derived nickel compounds for high performance supercapacitor and electrocatalysts

Shiva Bardhwaj

Prashant Kote

Ram Gupta

Follow this and additional works at: [https://digitalcommons.pittstate.edu/posters\\_2022](https://digitalcommons.pittstate.edu/posters_2022)

---

#### Recommended Citation

Bardhwaj, Shiva; Kote, Prashant; and Gupta, Ram, "Electrochemical properties of MOF-derived nickel compounds for high performance supercapacitor and electrocatalysts" (2022). *Posters*. 2.  
[https://digitalcommons.pittstate.edu/posters\\_2022/2](https://digitalcommons.pittstate.edu/posters_2022/2)

This Article is brought to you for free and open access by the 2022 Virtual Research Colloquium at Pittsburg State University Digital Commons. It has been accepted for inclusion in Posters by an authorized administrator of Pittsburg State University Digital Commons. For more information, please contact [lfthompson@pittstate.edu](mailto:lfthompson@pittstate.edu).

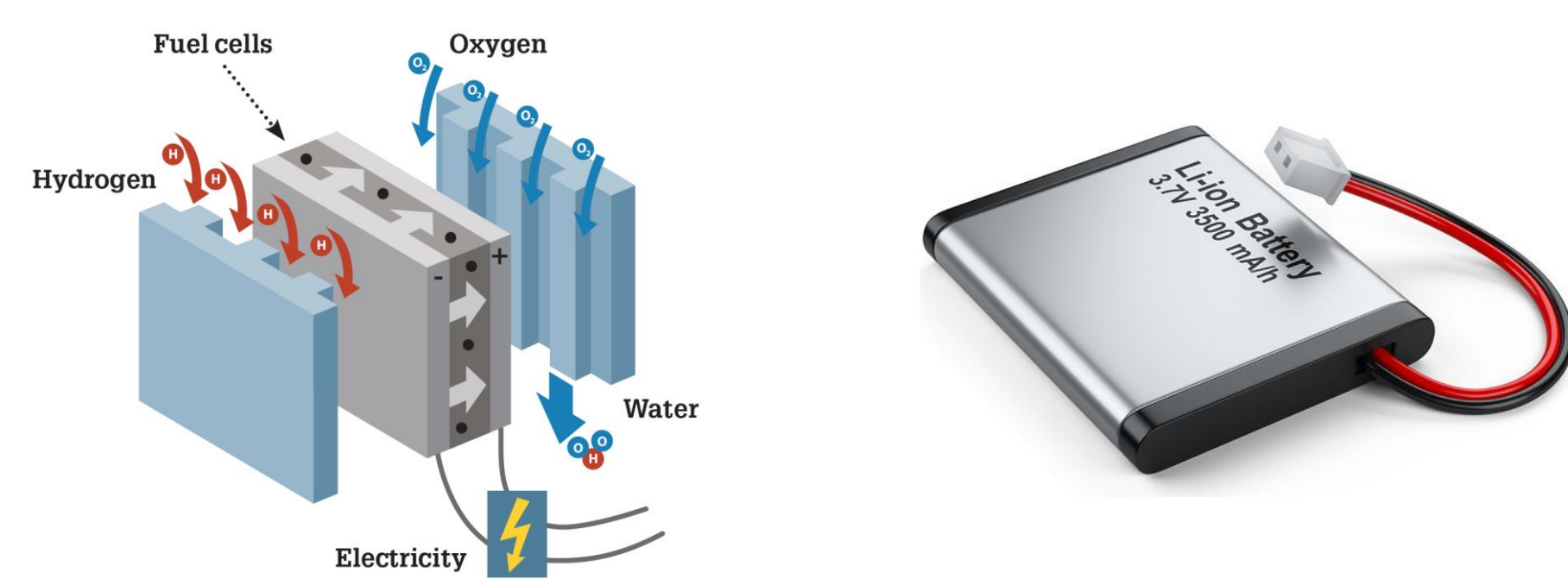


# Electrochemical properties of MOF-derived nickel compounds for high performance supercapacitor and electrocatalysts

Shiva Bhardwaj, Prashant Kote, and Ram K. Gupta  
Pittsburg State University, Pittsburg, KS 66762, USA

## Introduction

- Clean energy picture is possible when there is sustainable energy conversion for the storage devices.



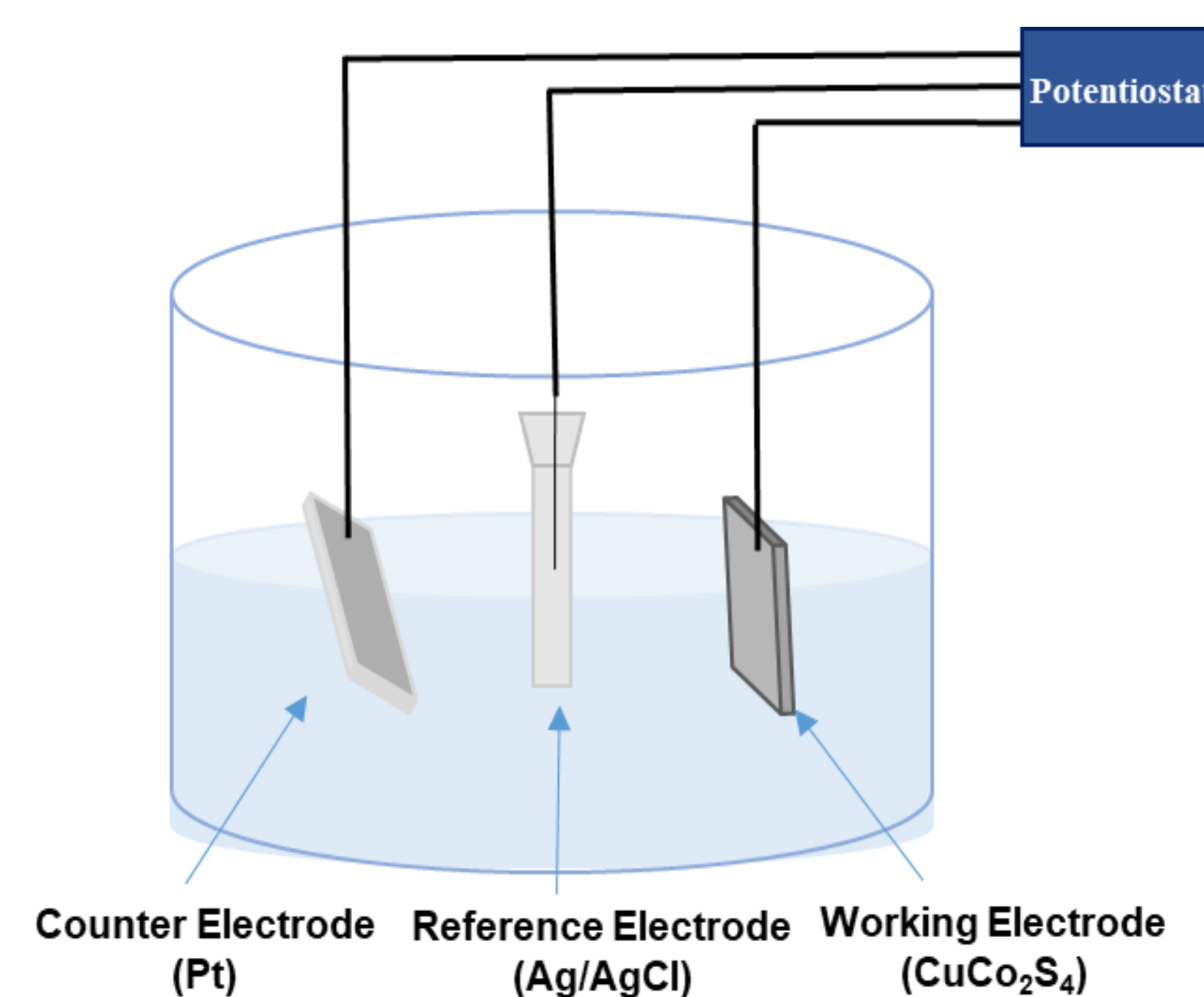
## Major Issues

- Depleting petroleum resources leads focus towards renewable natural resources.
- Low energy density for currently developed materials.
- Splitting water in alkaline media with high over-potential

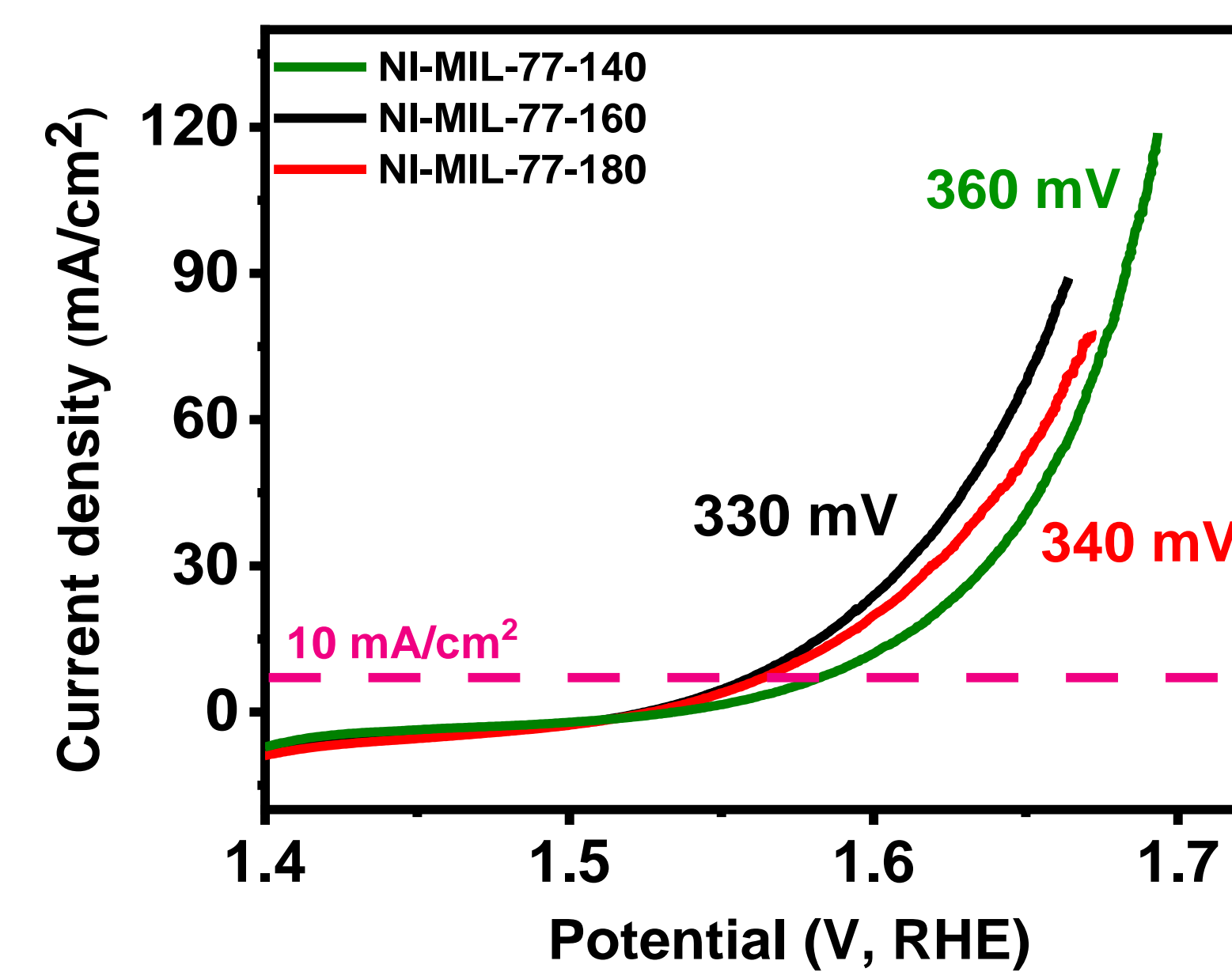


## Solution through our Research

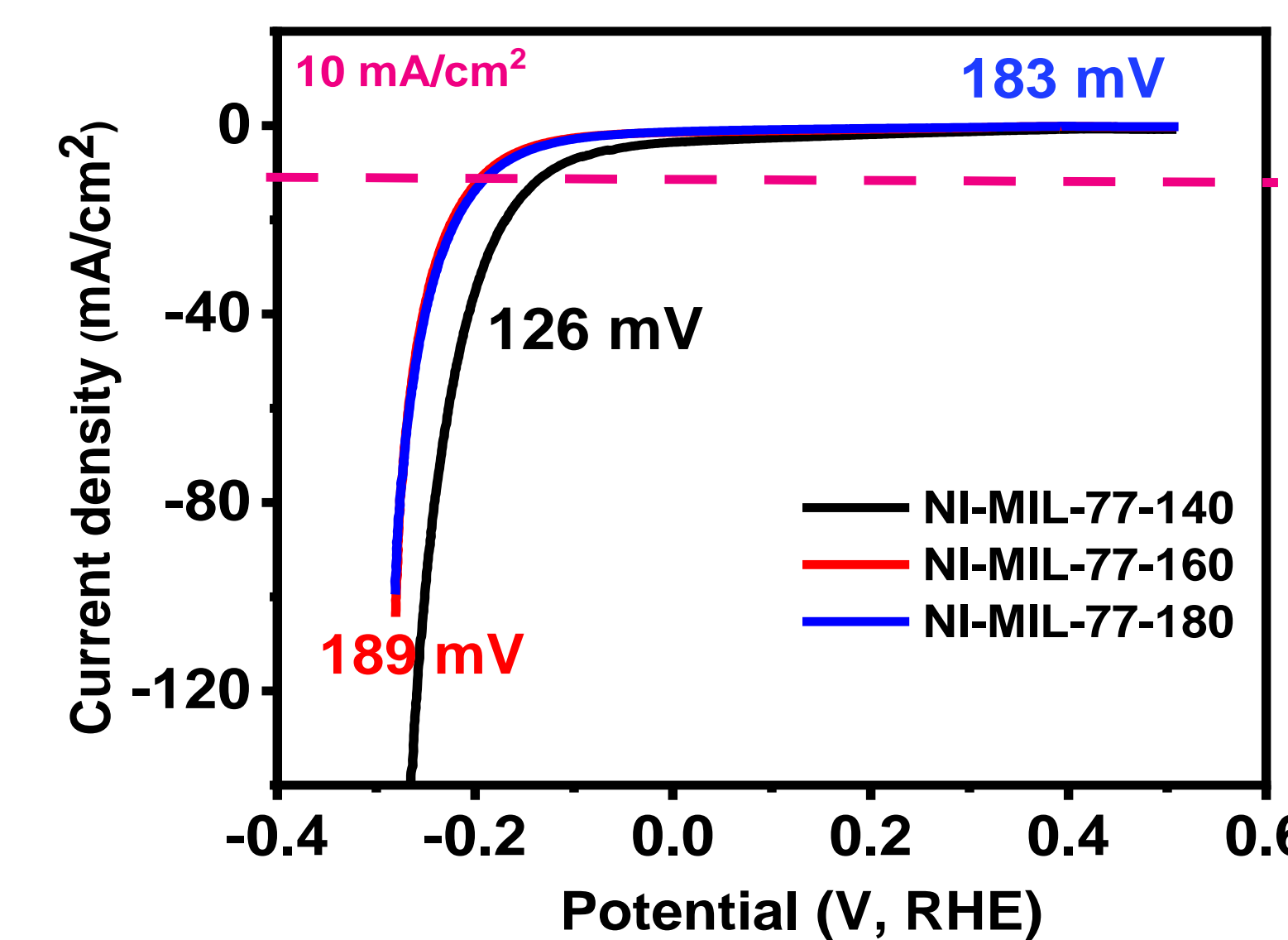
- Aliphatic compound glutaric acid was used for the synthesis of metal organic framework which help in replacing many harmful chemicals.
- All the sample prepared by hydrothermal method and can be easily scalable.



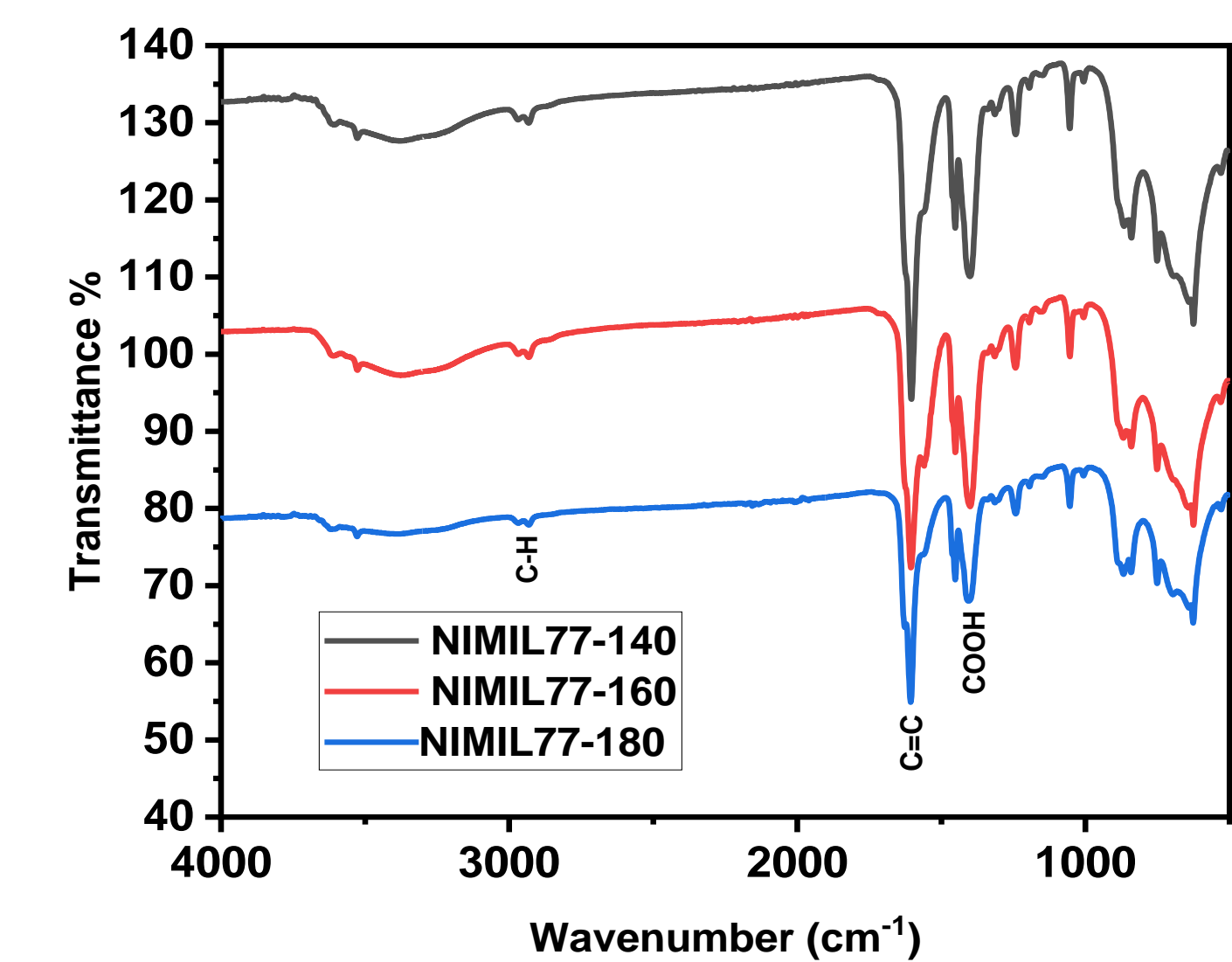
## Results



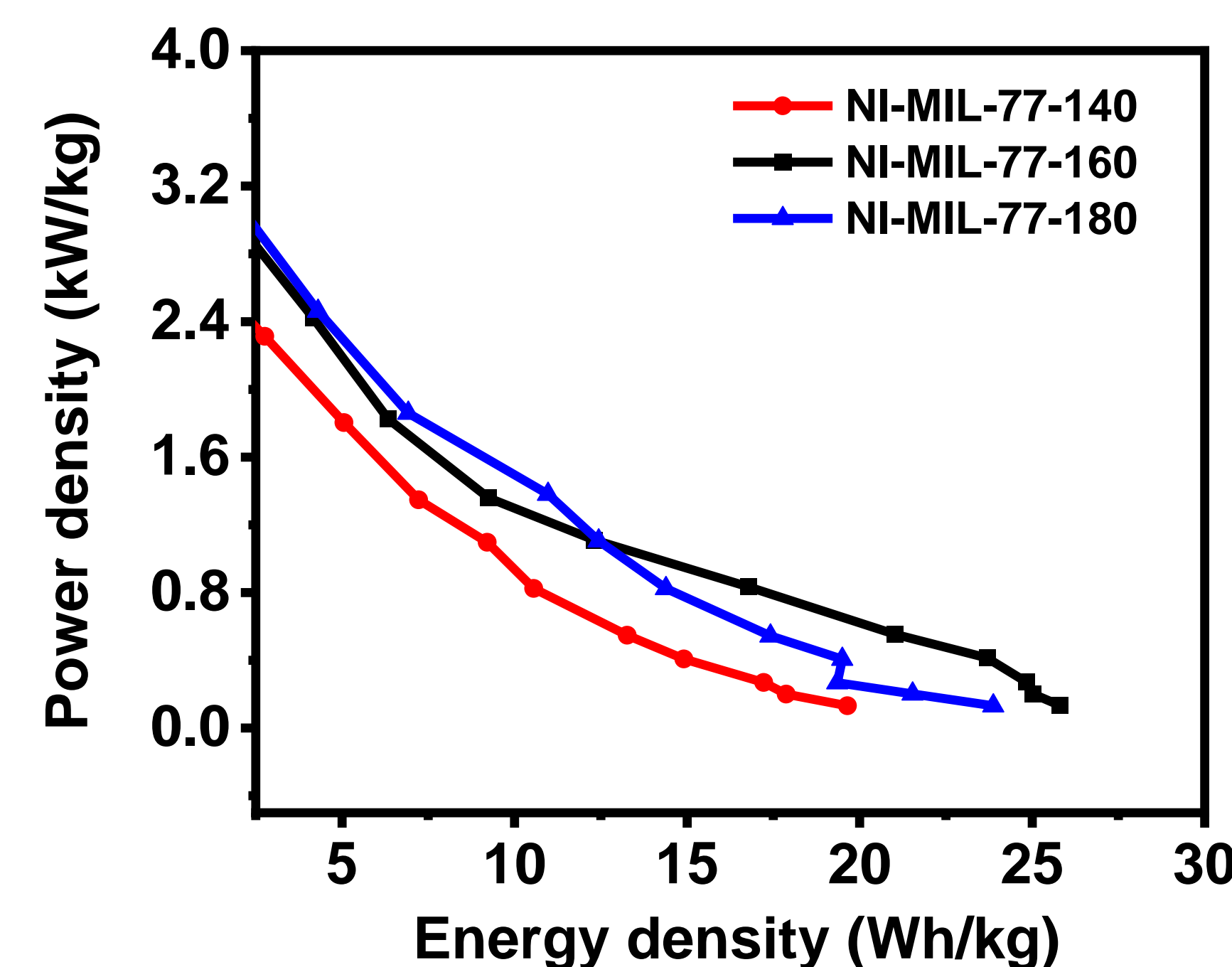
Over-potential representation for OER



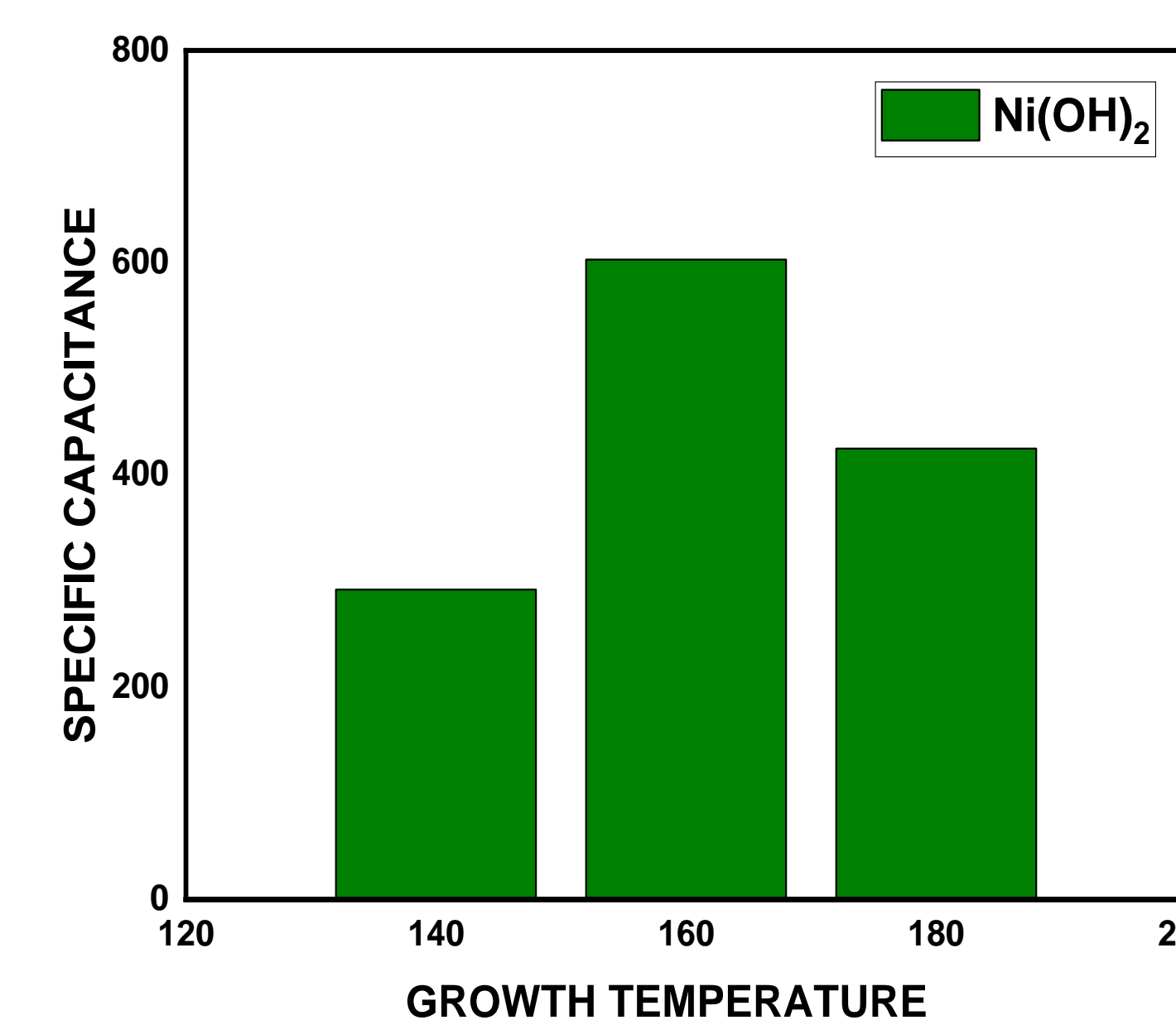
Over-potential representation for HER



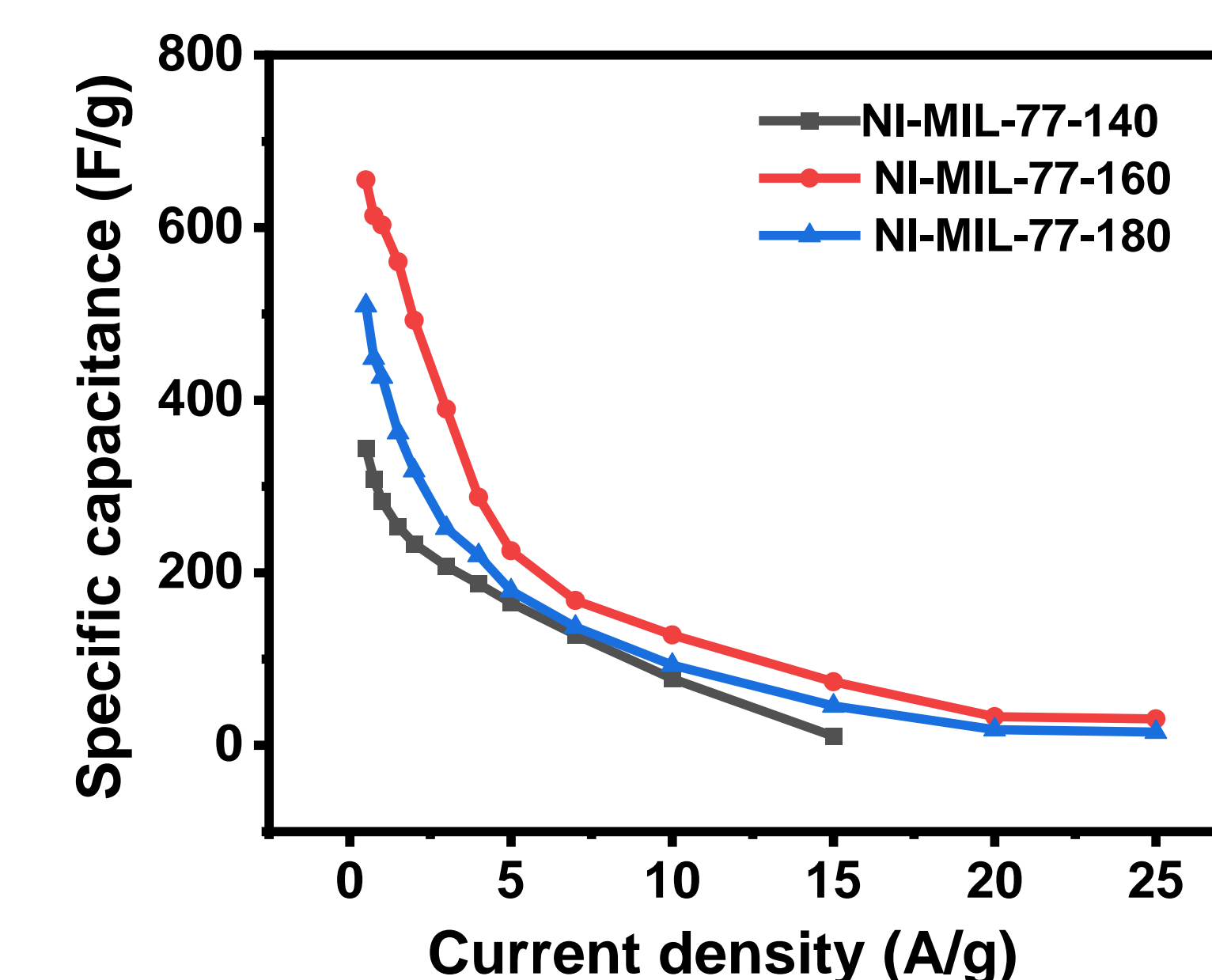
FT-IR image of Ni-based MOF



Graphical representation of power and energy density



Columns bars represents the effect of temperature on capacitance



Graphical representation of change of specific capacitance with current density

## Conclusions

- ❑ Nickel-based MOF is synthesized for the application of energy storage devices.
- ❑ The OER over-potential is 330 mV @ 10 mA/cm<sup>2</sup>, whereas for HER the over-potential is 126 @ 10 mA/cm<sup>2</sup>.
- ❑ FT-IR results shows the presence of glutaric acid.
- ❑ High specific capacitance maintained at high current density.

## Acknowledgement

Thanks to Material Science Program and Kansas Polymer Research Center at Pittsburg State University for providing research facilities.