Synthesis and Characterization of Nickel-Titanium Layered Double Hydroxides

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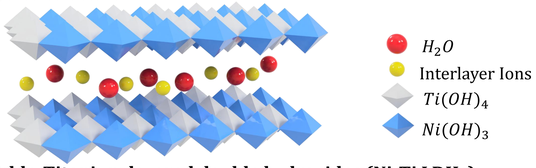
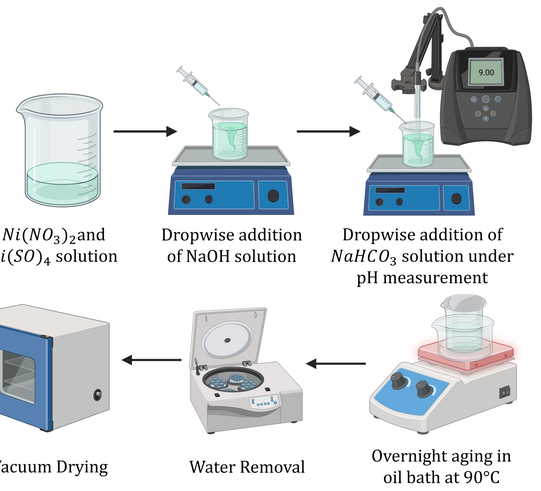
Introduction

- **Layered double hydroxides (LDHs):** high surface area and unique layered structure



- **Nickle-Titanium layered double hydroxides (Ni-Ti LDHs):** various catalytic and environmental applications
  - As-prepared for photocatalysis
  - Metal oxides (after calcination) as catalysts for the production of chemicals/fuels
- **Research Goal:** Optimize the source of base to control pH and use characterization techniques to understand chemical and physical properties

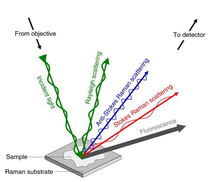
Catalyst Synthesis



Characterization Techniques

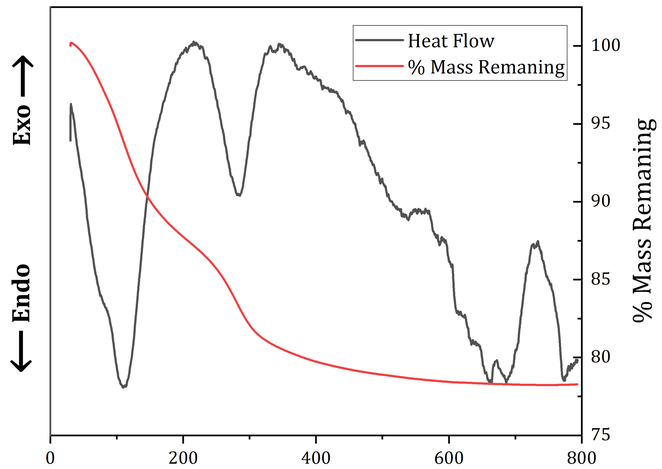
Thermogravimetric Analysis (TGA): Used to determine an appropriate calcination temperature

Raman Spectroscopy: Provides insights on chemical stricture and crystallinity



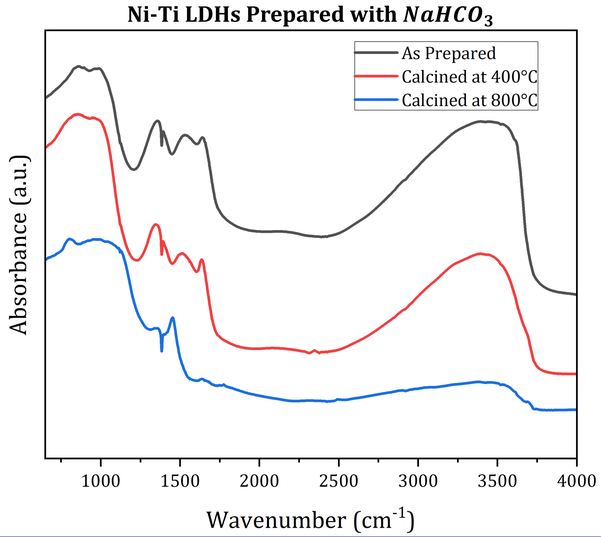
Infrared Spectroscopy (IR): Provides insights on chemical structure and bonds

Thermogravimetric Analysis



Initial calcination temperature determined to be 400°C

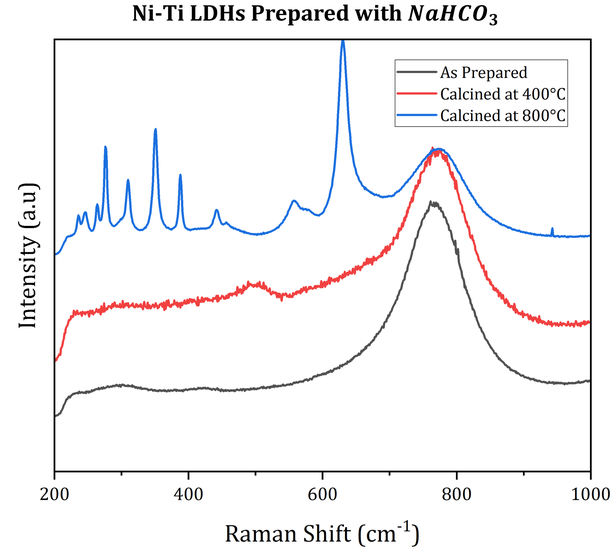
Infrared Spectroscopy



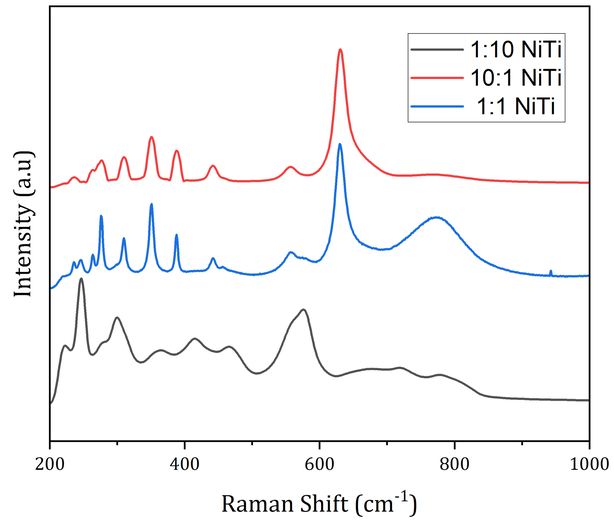
Summary

- $NaHCO_3$ is the most optimal base to control pH
- After calcination, the ratio of Ni/Ti determines the structure
- **Next Steps:** Application in carbon dioxide conversion

Raman Spectroscopy



Raman Spectra for Various Ratios Calcined at 800°C



Acknowledgments

UNH Hamel Center for Undergraduate Research, Seth Drahusz, and Sebastian Nichols

References

[1] *Layered Double Hydroxides: Present and Future,* Vicente Rives, 2001, Nova Science Publishers Inc

[2] *ACS Sustainable Chem. Eng.* 2024, 12, 1, 595-609