



CHARACTERIZATION OF ALUMINA SUPPORTED SYN-GAS CONVERSION BIMETALLIC NANOCATALYSTS

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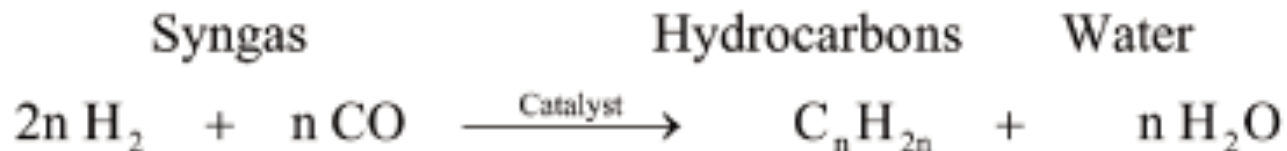
INTRODUCTION

PART 1

FISCHER-TROPSCH PROCESS

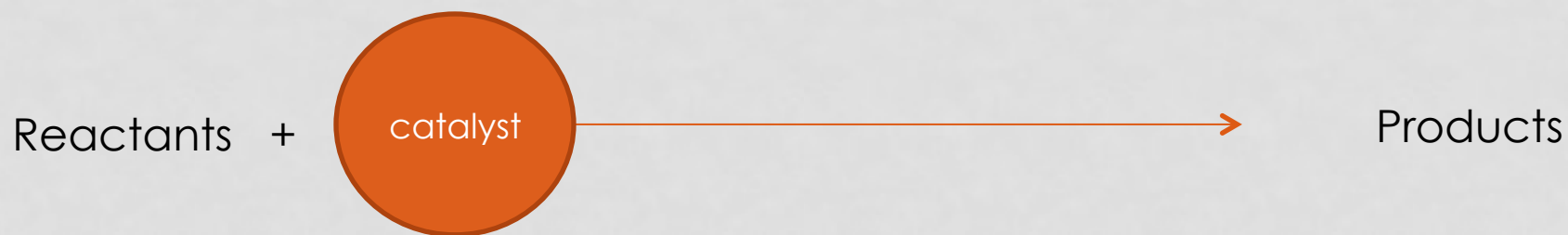
- FT is a series of chemical reactions that convert carbon monoxide (CO) and hydrogen (H₂).
- It was first developed by Franz Fischer and Hans Tropsch in Germany in 1925.
- The process produces a lubrication oil and synthetic fuel typically from coal, natural gas, or biomass.
- It is a key component of gas to liquid technology.

Fischer - Tropsch Synthesis



NANOPARTICLE CATALYSTS

- A catalyst is something which changes the rate of a chemical reaction.
- Catalysts are useful because they leave no residue in the solution they have speeded up.
- Catalysts are supported on high-surface-area binders/supports such as silica.



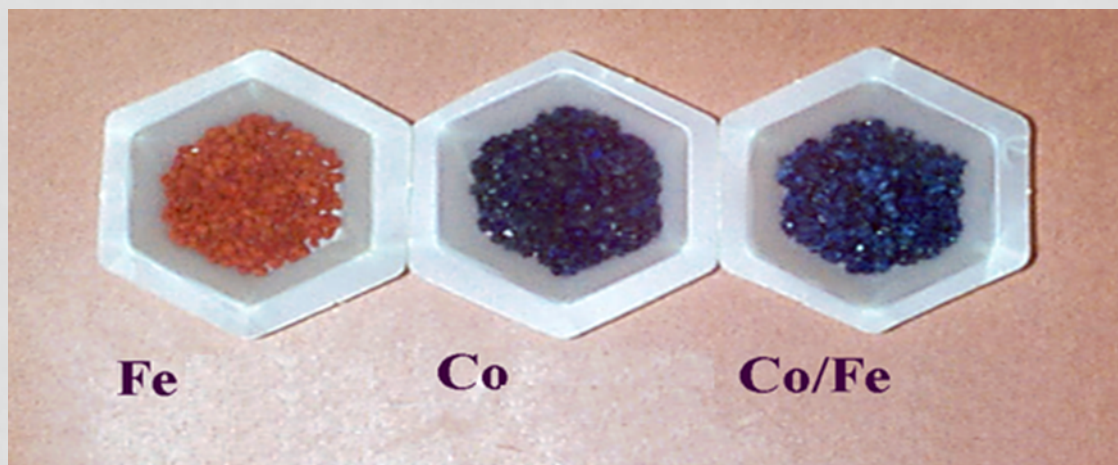
CATALYST PROPERTIES

- Large surface area
 - Changes occurring during catalyst life are almost always a result of catalyst surface area loss.
- Thermally and structurally stable
 - Reactions take place at very high temperatures ($\sim 400^{\circ}\text{C}$)
- High Catalytic activity
 - Current FT reaction rates are between 25% and 50%



PURPOSE & OBJECTIVE

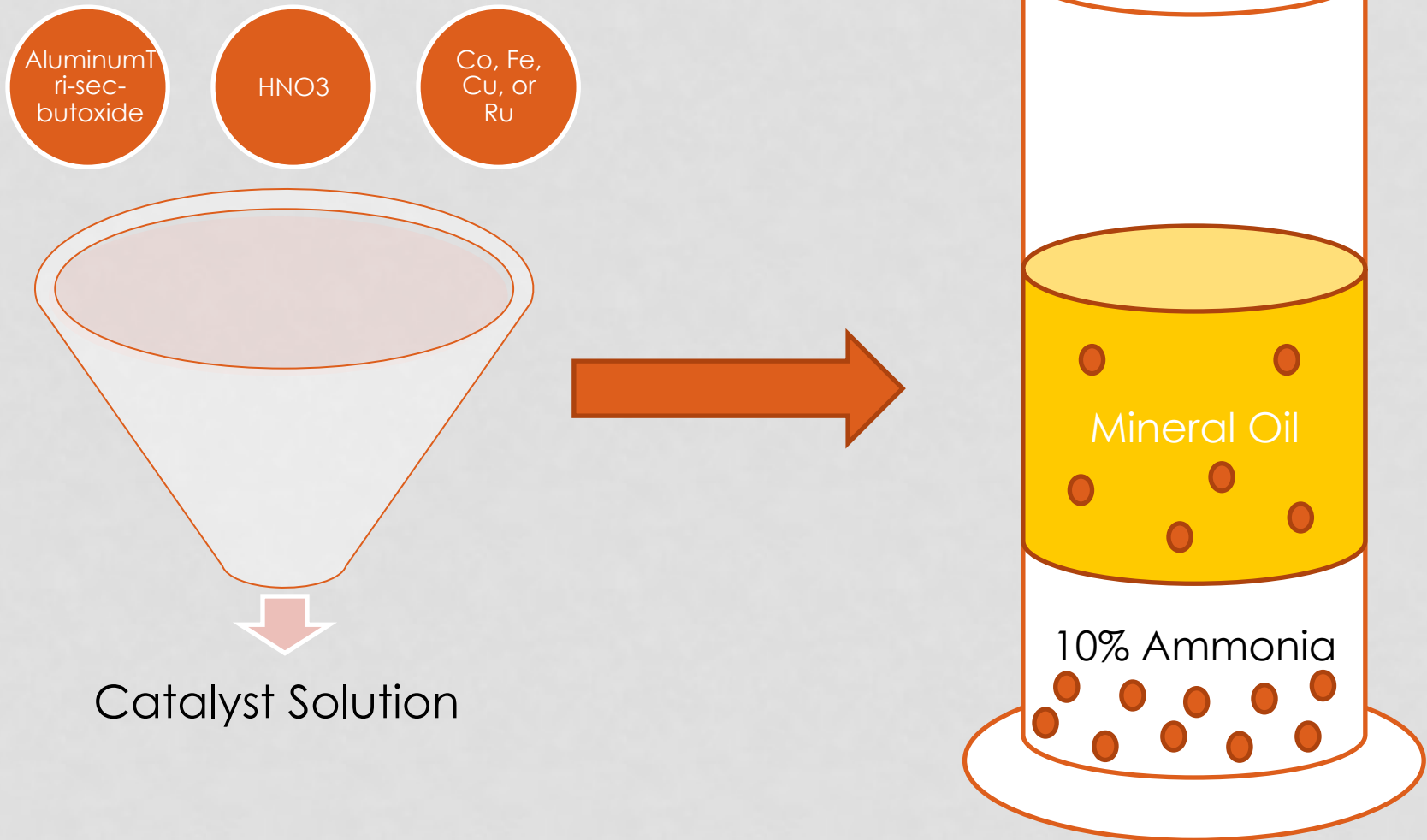
- The purpose of this project is to **increase the efficiency of the Fischer-Tropsch** process by targeting the most effective catalyst for the reaction.
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- By analyzing the **thermal and magnetic properties** of these samples, we will be able to **provide estimations on surface area, metal loading, reduction efficiency, and poisoning of the catalyst.**



SYNTHESIS OF CATALYSTS

PART 2

SYNTHESIS SOL- GEL SHAPED NANOPARTICLE CATALYSTS



SYNTHESIS (cont'd)



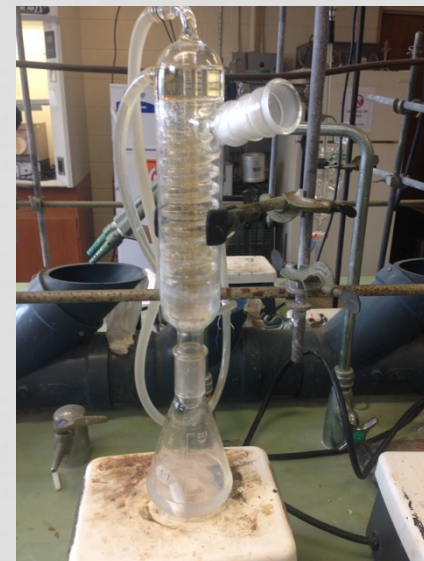
Heat



Filter



Prepare



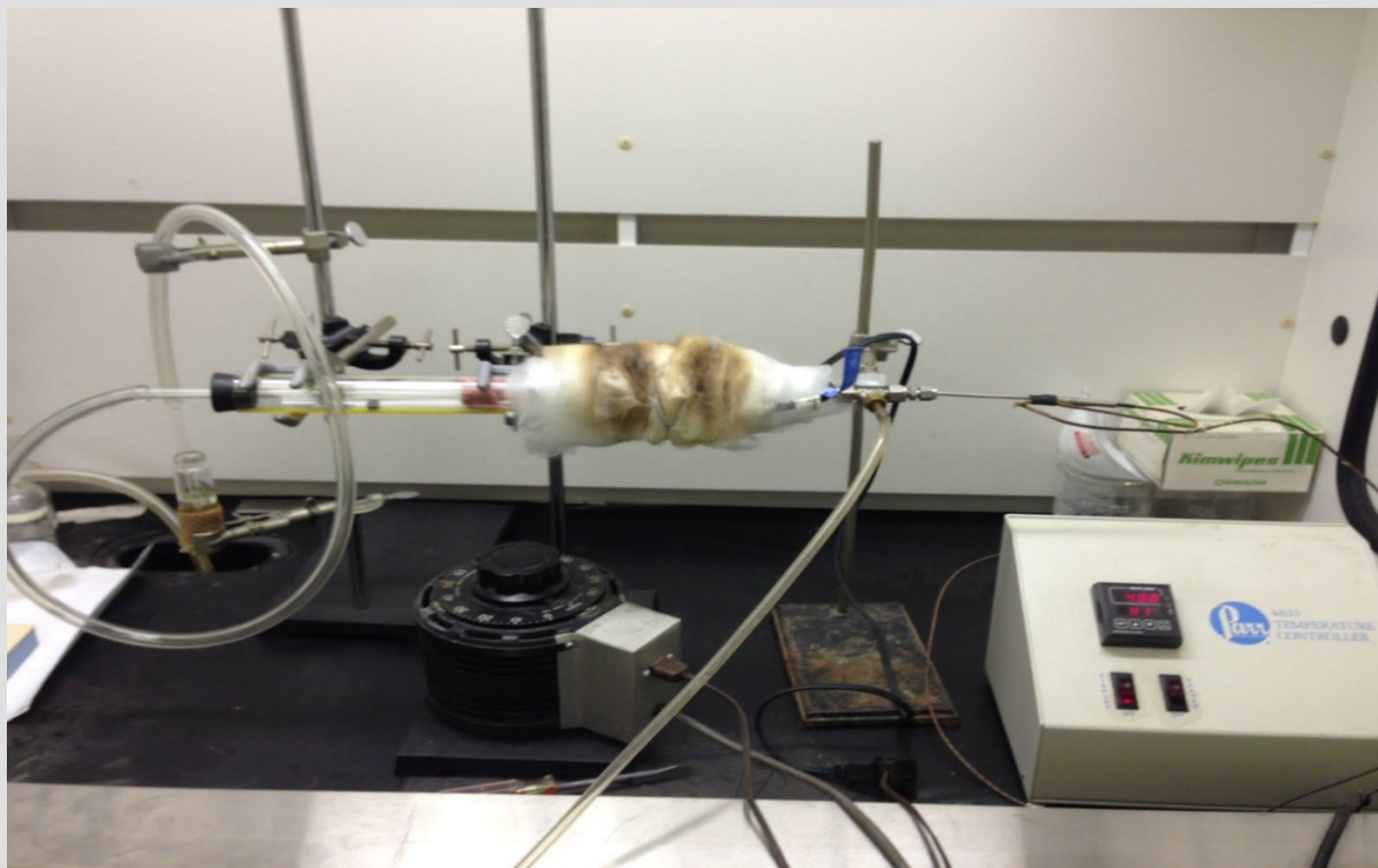
Reflux

CALCINATION

Sample is heated to $\sim 450^{\circ}\text{C}$ overnight to dry excess water



REDUCTION OF CATALYSTS



CHARACTERIZATION OF CATALYSTS

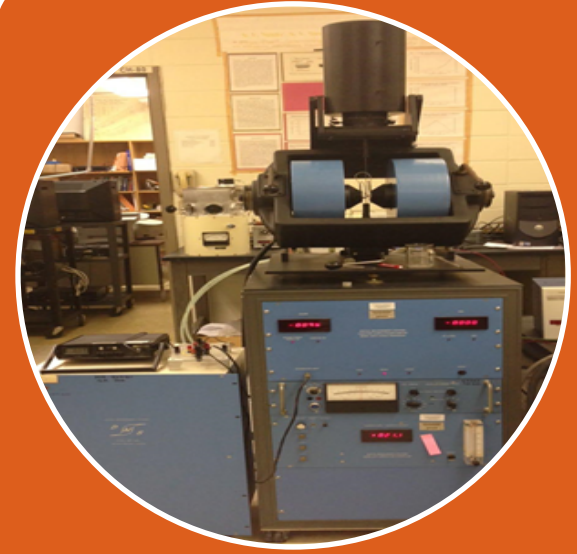
PART 3



**Differential
Thermal
Analysis**



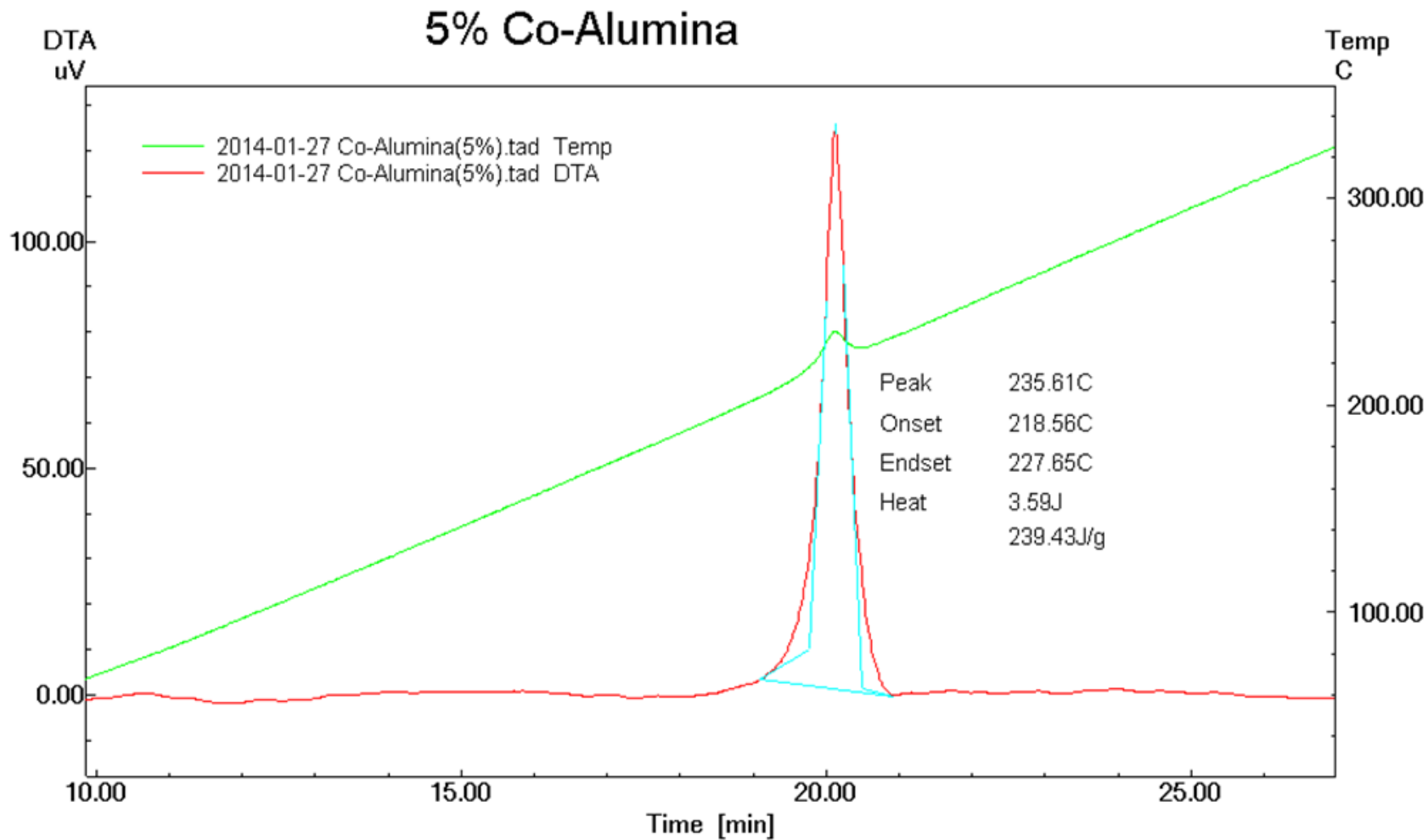
**Thermal
Gravimetric
Analysis**



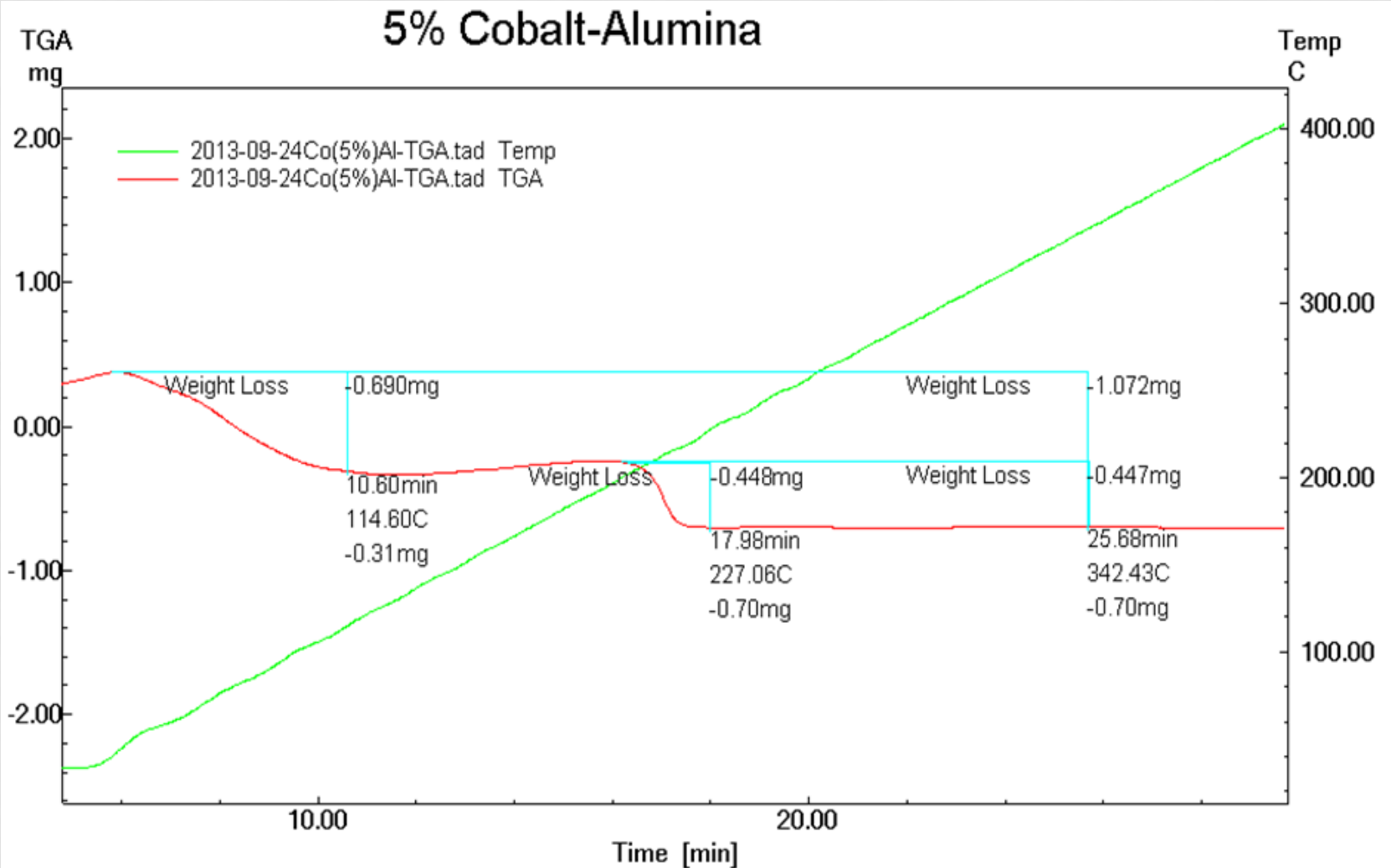
**Vibrating
Sample
Magnetometer**

Analyzing Apparatuses

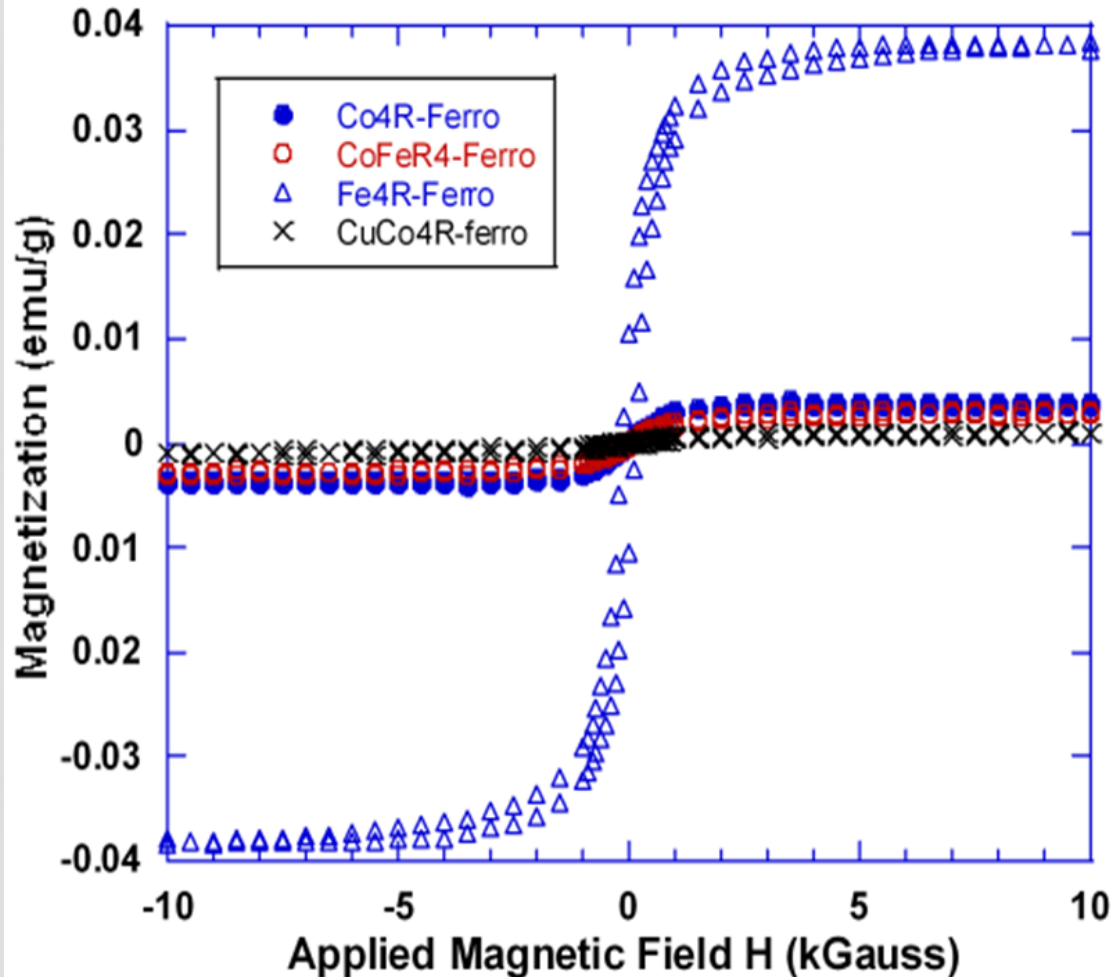
DTA RESULTS



TGA RESULTS



VSM & SATURATION MAGNETIZATION



- Saturation is the state reached when an increase in applied external magnetic field cannot increase the magnetization of the material further
- It is a characteristic particularly of ferromagnetic materials, such as iron, nickel, cobalt and their alloys.

CONCLUSION & FUTURE WORK

- Alumina supported heterogeneous granular catalysts were successfully prepared by sol-gel-oil drop method
 - Thermal analysis shows successful calcination below 450°C
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- Focus on surface area studies using the BET method
 - Perform Gas Chromatography and elemental analysis to further study catalyst components
 - Continue synthesizing and characterizing catalysts

QUESTIONS?

THANK YOU!



Acknowledgments

This material is based upon work supported by the National Science Foundation under the NSF EPSCoR Cooperative Agreement No. EPS-1003897 with additional support from the Louisiana Board of Regents.