

Development of a Novel Fe Based Heterogeneous Catalyst for CO₂ Conversion



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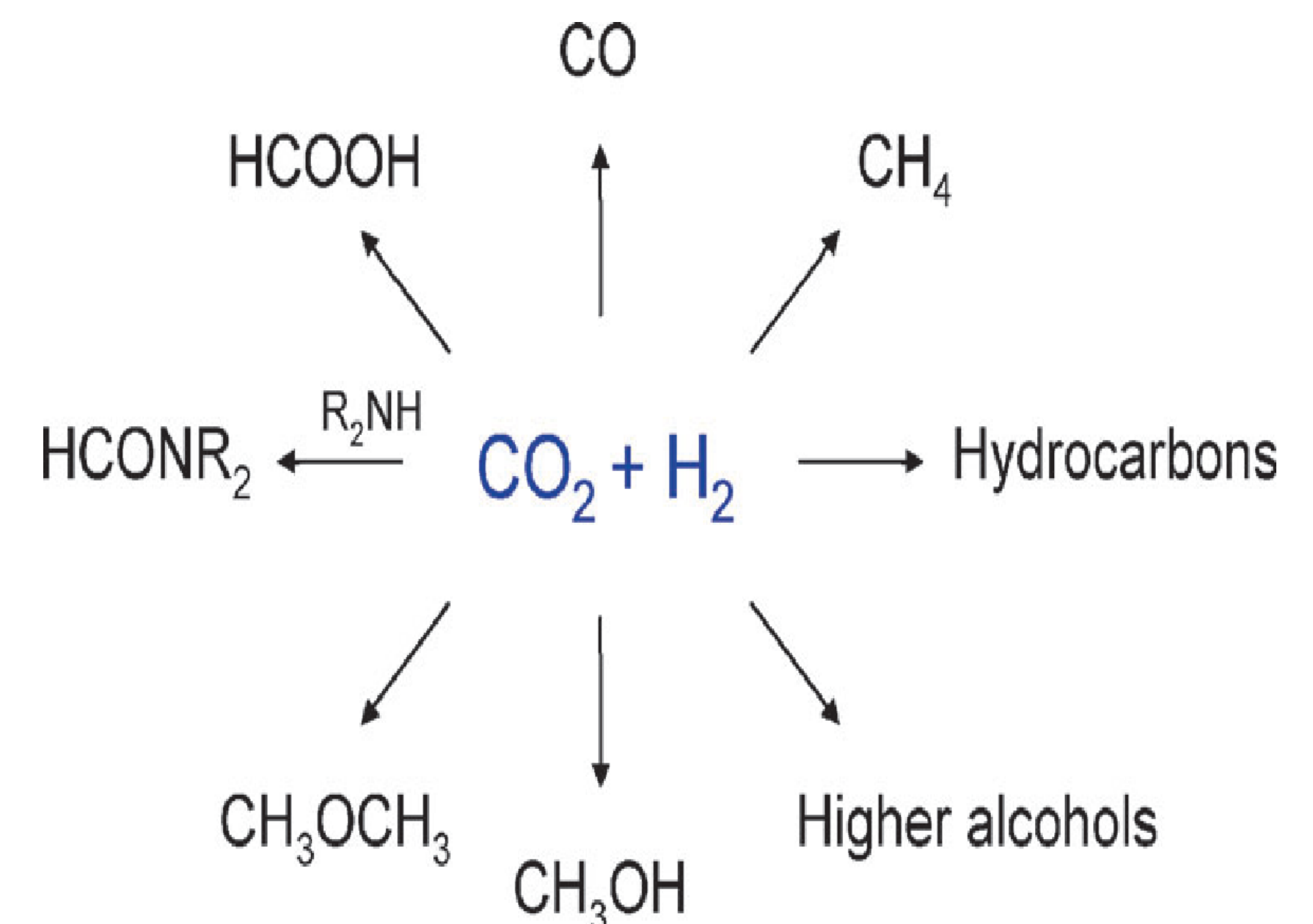
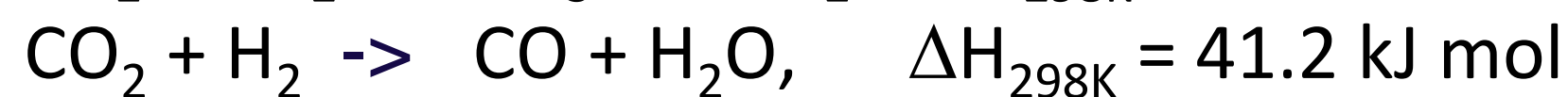
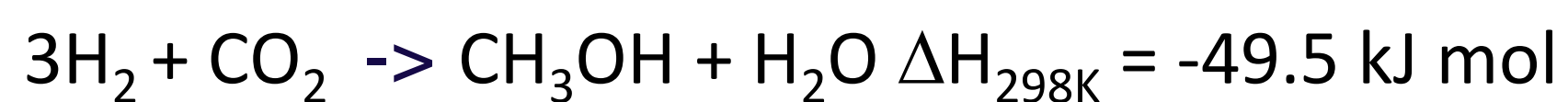
Objective

To develop a novel Fe based heterogeneous catalyst to enhance the catalytic conversion of CO₂ by H₂ for the synthesis of value added chemicals such as CO, methanol and fuels.

Background

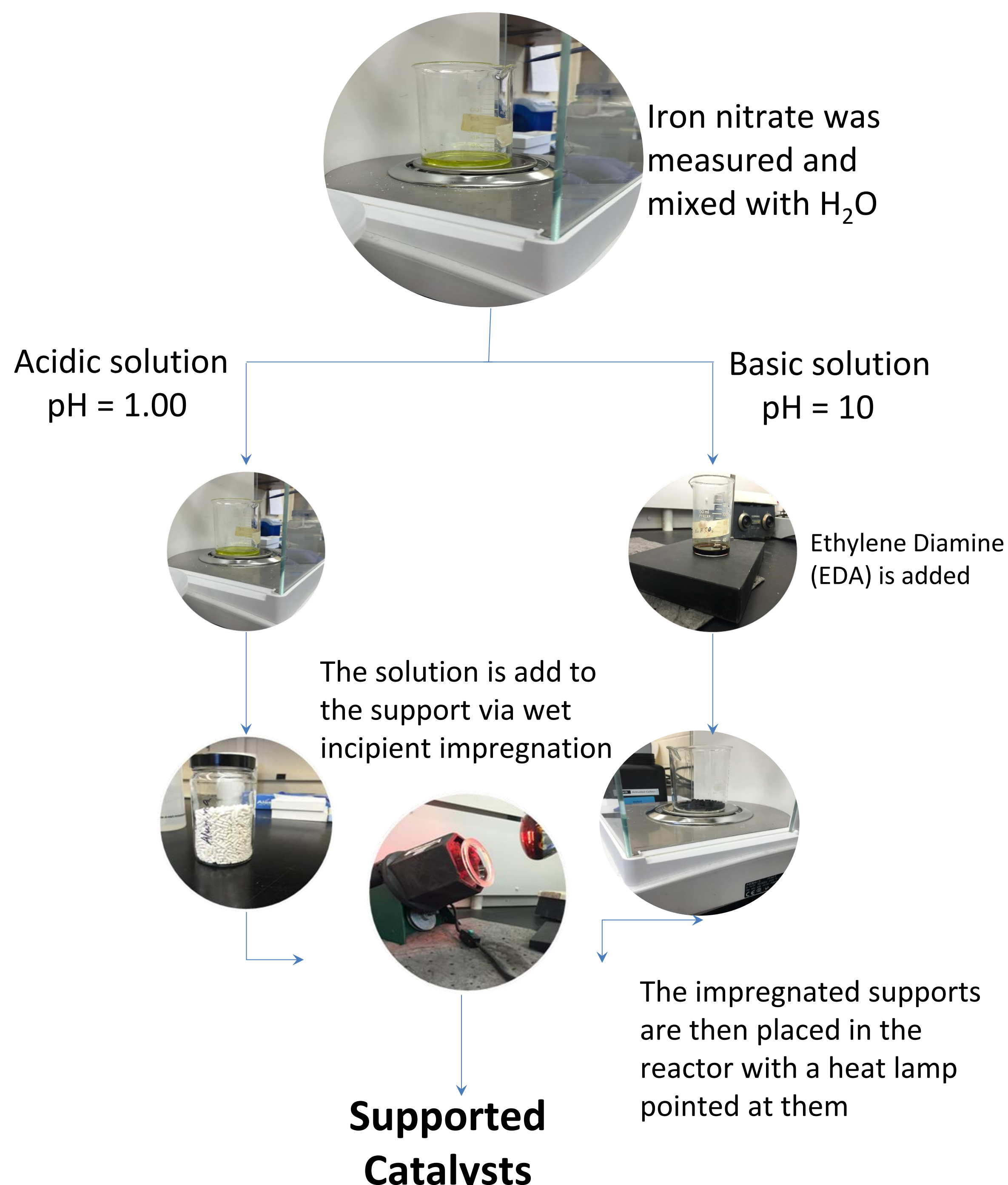
Greenhouse gas emission has been a growing problem on the earth because of global warming and pollution of our air. We want to create a catalyst to turn CO₂ into something that can be used in everyday life.

Chemistry



Experiments

1. Put 3.5 grams of water in a beaker
2. Add .72 grams of oxalic acid to the beaker and dissolve
3. Add 1.08 grams of ferric nitrate to the above solution
4. For active carbon supported add EDA drop wise until the pH is 10
5. Add above solution onto support and place in the reactor until H₂O is evaporated.



Results

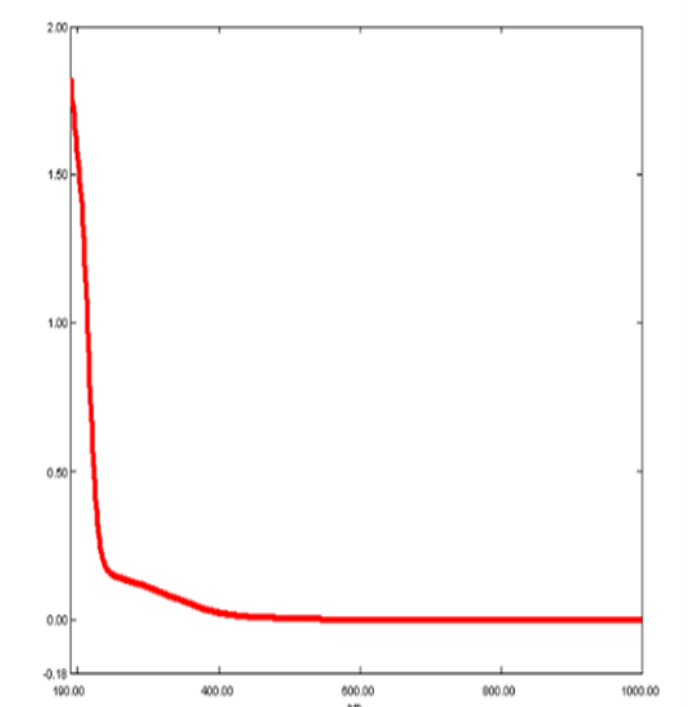
- The solution was characterized by UV at the wavelength of 190 ~ 1000 nm. The absorbance for the Fe (III) species was observed at 192 nm.
- The iron solution was tuned to basic and acidic solution to adapt to different support
- Using wet incipient method, two uniformly impregnated supported catalysts (silica supported and active carbon supported) were successfully prepared



Silica supported iron catalyst



Active Carbon supported iron catalyst



Future work

1. Test the performance of the synthesized catalysts using a continuous fix-bed reactor.
2. Collaborate with Brookhaven national lab and the Dalian Institute of Chemical Physics on the catalyst characterizations: FT-IR, XRD, BET, TEM, SEM and XPS.
3. Establish the relationship between the activity and property
4. Understand the reaction of CO₂ hydrogenation into fuel.

References

1. Michele Aresta, A et al (2013) The changing paradigm in CO₂ utilization. Journal of CO₂ utilization: 65-73
2. Wei Wang A et al (2011) Recent advances in catalytic hydrogenation of carbon dioxide. Chem.Soc.Rev., 40 3703-3727