

Innovative Silver-Based Catalyst for Oxidation of Methane to Methanol

LIU
Post

BROOKHAVEN
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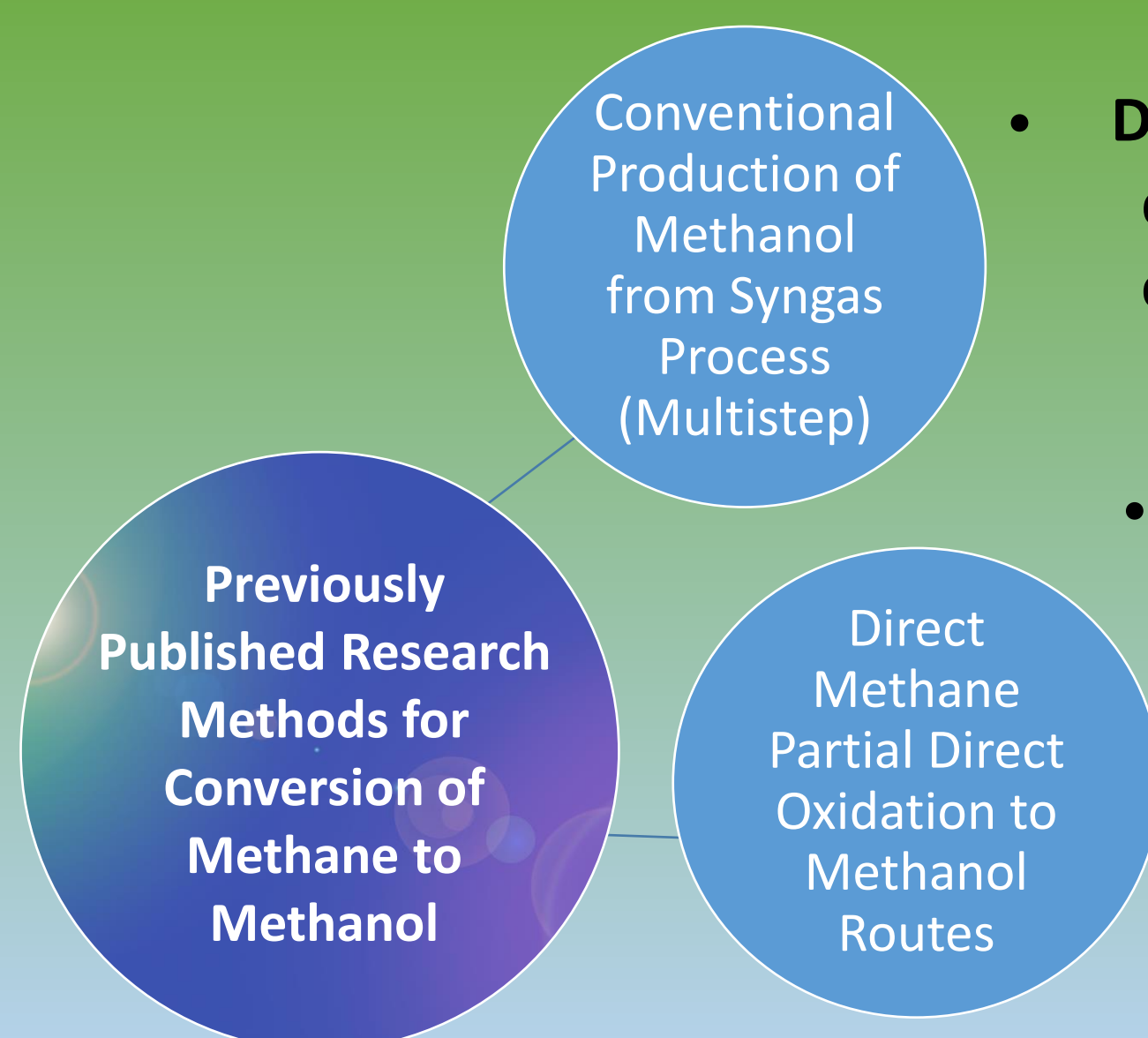
DALIAN INSTITUTE OF CHEMICAL PHYSICS,
CHINESE ACADEMY OF SCIENCES

BACKGROUND:

☐ Methane is a main component of many natural gas reserves

☐ It is fundamental for an effective method to be developed for inexpensive and abundant methane to be converted to value added chemicals:

- Methanol
- Formaldehyde
- Acetic acid
- Carbon monoxide
- Fuel



• **Disadvantage:** Costly due to high-energy consumption

• **Disadvantages:**

- Reaction is thermodynamically spontaneous at room temperature
- Difficult to control the selectivity of products
- Methanol is more reactive than methane

↳ Led to research for the development of a highly selective catalyst

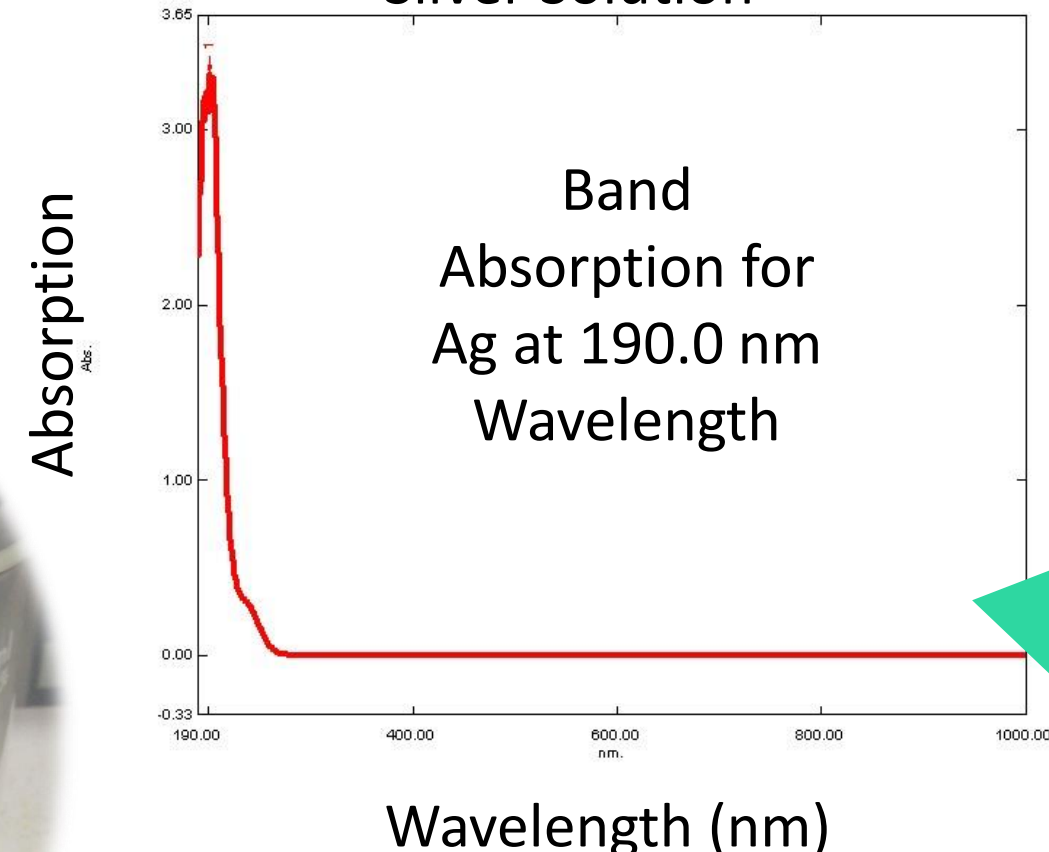
OBJECTIVE:

The development of an innovative silver-based catalyst will be created as an alternative, more effective method for the conversion of methane to methanol

METHOD:

Solution Chemistry to Prepare Ag-Based Solution

Ultraviolet-Visible Spectroscopy of Silver Solution



Wet Incipient Impregnation of Ag Solution on Carbon Support (Basic)

Observed Color Change Black to Clear Immediately
pH = 10.67

Final Ag-Based Catalyst

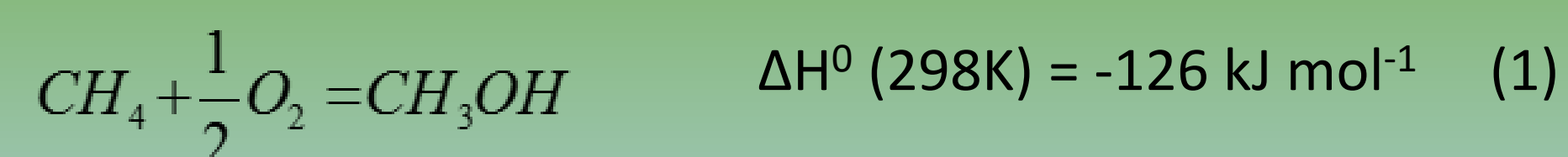
0.416 g Ethylenediamine Added to 2.5 g Di-Water with Stirring

0.283 g Oxalic Acid Added with Stirring

0.107 g Silver Oxide

Added To

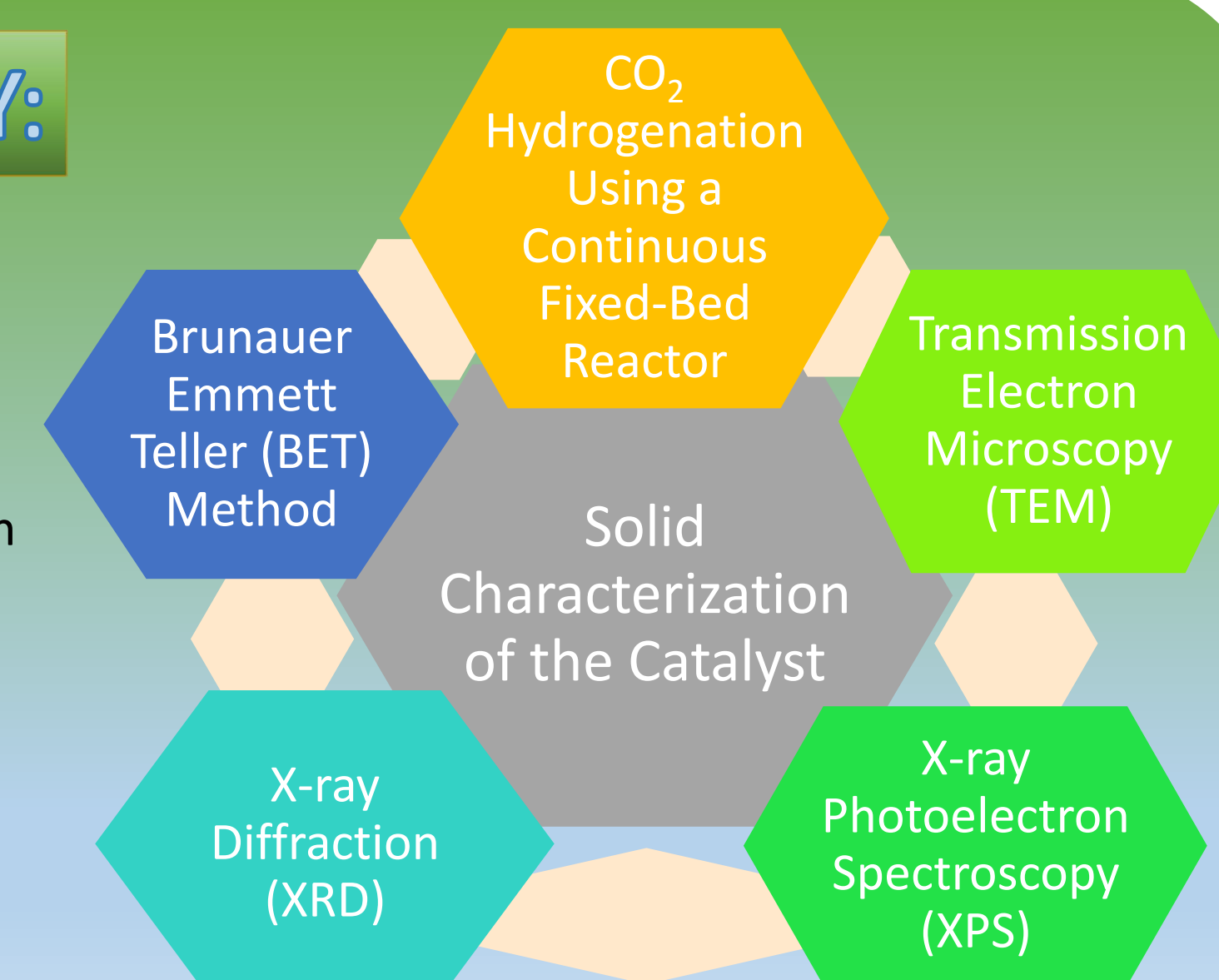
Thermodynamic Analysis of Reactions:



FUTURE STUDY:

Collaboration with Brookhaven National Laboratory and the Dalian Institute of Chemical Physics in China

- ☐ Establish Relationship Between Activity and Properties
- ☐ Test Performance of Silver-Based Catalyst for Oxidation of Methane to Methanol
- ☐ Understand Reaction Pathway of Methane to Methanol



REFERENCES:

- Jose da Silva, M. (2016). Synthesis of methanol from methane: Challenges and advances on the multi-step (syngas) and one-step routes (DMTM). *Fuel Processing Technology*, 145, 24-61.
- Khirsariya, P. & Mewada, R. K. (2013). Single step oxidation of methane to methanol: Towards better understanding. *Procedia Engineering*, 51, 409-415.

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