XIV JORNADA DE JÓVENES INVESTIGADORES/AS DEL I3A

METHANOL SYNTHESIS FROM CO_2 HYDROGENATION OVER CU-ZnO-BLACK TiO_2 CATALYSTS: EFFECT OF COPPER LOADING AND ZnO PROMOTION

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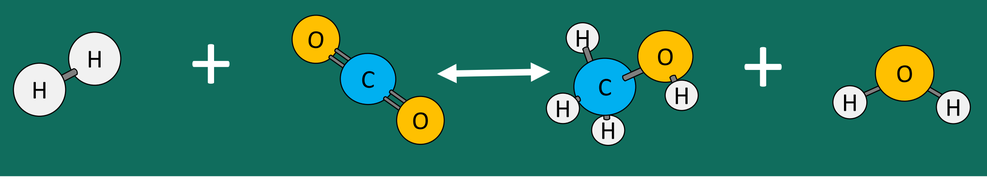
INTRODUCTION

Methanol is a key molecule in the transition toward a sustainable economy, serving as an alternative fuel, energy carrier, and platform chemical for industrial applications. A promising strategy for its sustainable production is the direct synthesis from CO_2 and H_2, enabling the transformation of CO_2 from a waste product into a valuable resource.

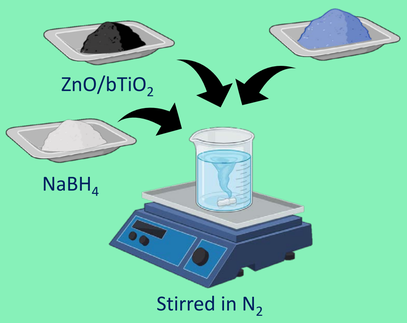
Recent studies have shown that the presence of oxygen vacancies in catalytic materials can significantly enhance their performance in CO_2 adsorption and activation, thus promoting its conversion. In this work, copper-based catalysts supported on reduced titania, also known as *black titania*, will be investigated. This material exhibits improved electronic conductivity and a high concentration of oxygen vacancies, making it a promising support to boost the efficiency of CO_2 hydrogenation to methanol.



CATALYST PREPARATION

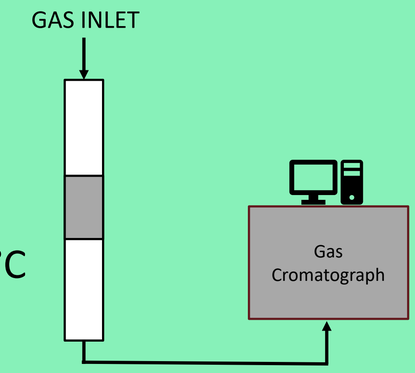
1° STEP: Zn IMPREGNATION

2° STEP: Cu IMPREGNATION



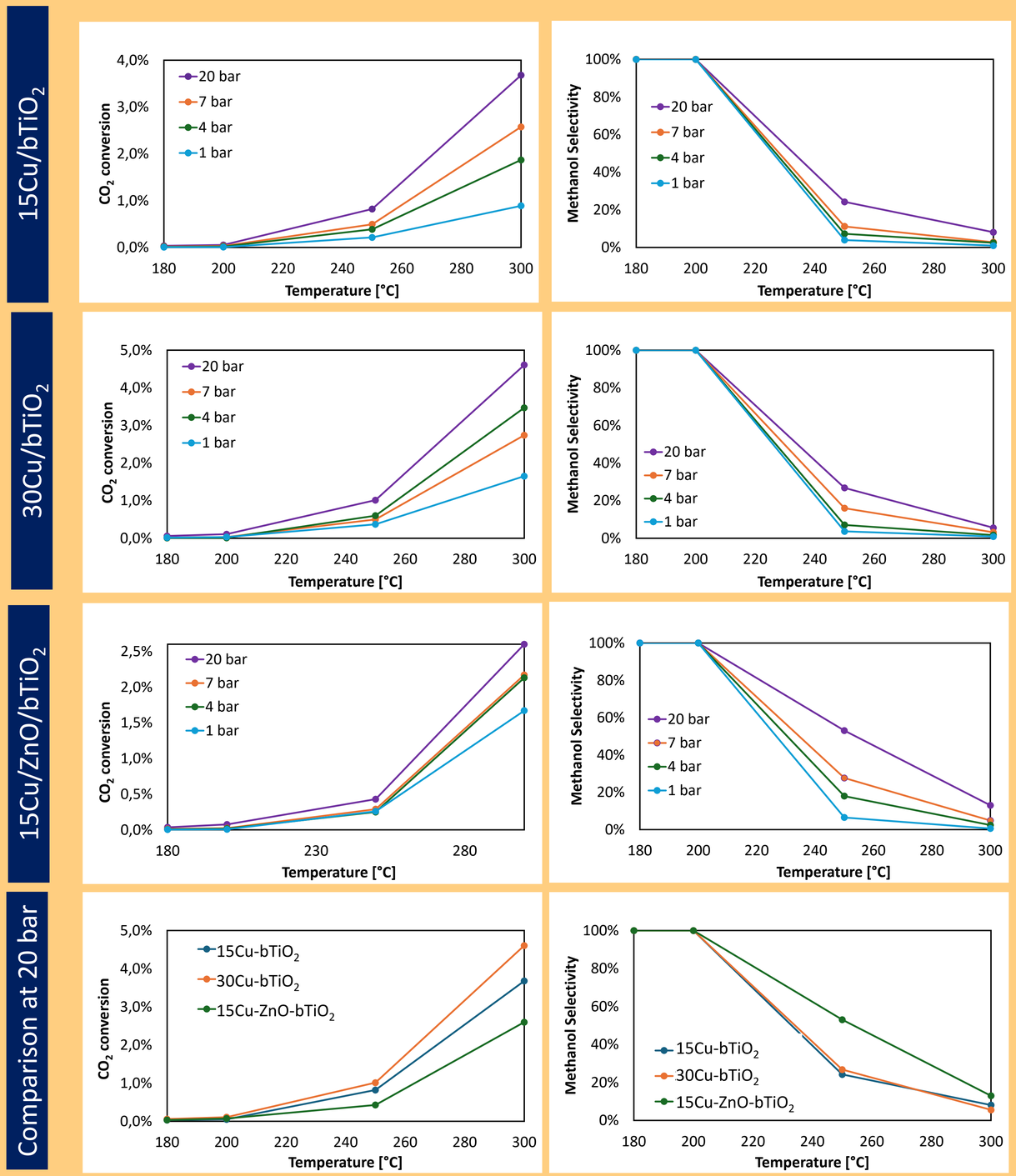
OPERATING CONDITIONS:

- FEED: 30 % CO_2 – 70 % H_2
- WHSV: 10 h^{-1}
- TEMPERATURE: 180, 200, 250, 300 °C
- PRESSURE: 1, 4, 7, 20 bar



Sample Name	Cu wt. %	ZnO wt. %	$bTiO_2$ wt. %
15Cu/$bTiO_2$	15	/	85
30Cu/$bTiO_2$	30	/	70
15Cu/ZnO/$bTiO_2$	15	35	50

RESULTS



CONCLUSIONS

- **The copper loading influences CO_2 conversion but does not affect methanol selectivity.**
- **Pressure affects the system by increasing CO_2 conversion at temperatures above 200 °C.** Its effect on methanol selectivity is observed only at 250 °C, while at lower (180 °C and 200 °C) and higher (300 °C) temperatures, selectivity remains similar across all tested pressures.
- **The addition of ZnO to the system leads to a decrease in CO_2 conversion but enhances methanol selectivity**

Aknowledgment

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