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CARBON-BASED MICROFIBERS CATALYSTS FOR METHANOL PRODUCTION BY CO_2 HYDROGENATION

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The hydrogenation of COpromising and sustainable pathway for the production of methanol, offering a viable alternative to conventional fossil-based methods. Structured catalysts with Cu/ZnO metal phases are typically used in methanol synthesis.

Cu/ZnO/carbon nanofibers catalysts were prepared by electrospinning of a lignin-based solution, followed by thermal treatments: stabilization in air and carbonization in inert atmosphere.

Two different methods were used to incorporate the Cu/ZnO active phase precursor:

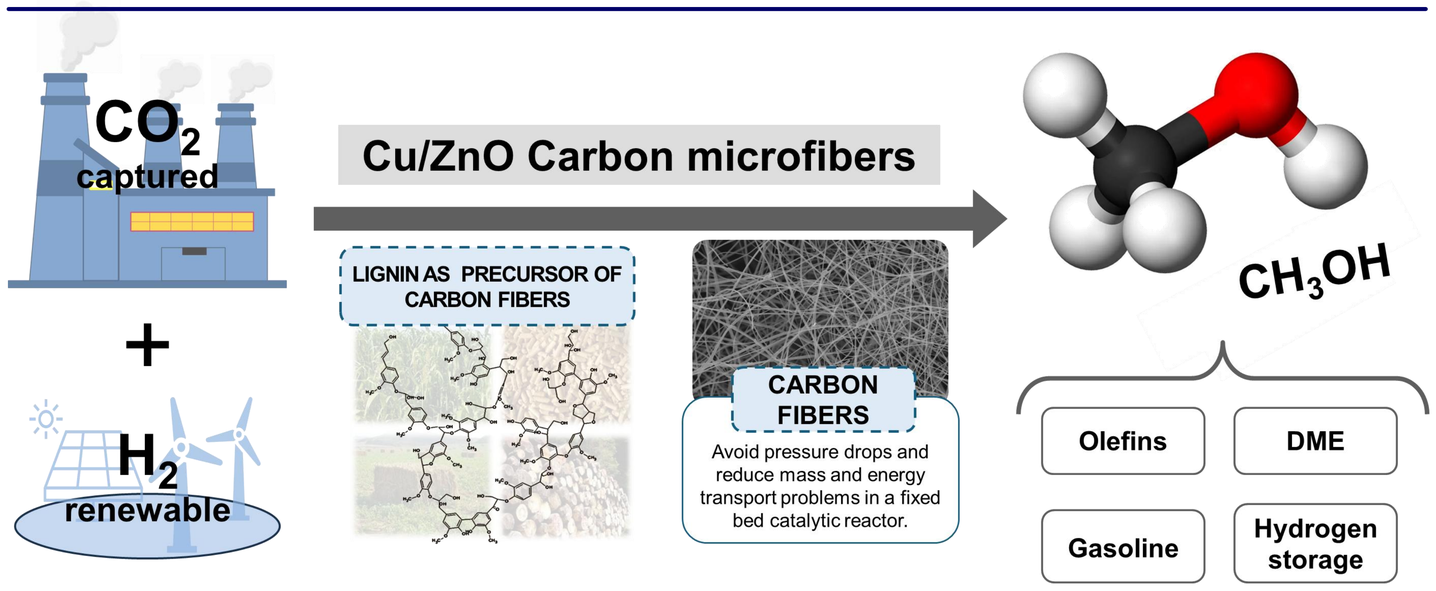
i) **Direct addition to the lignin solution**

ii) **Wet impregnation on pre-carbonized fibers at 500ºC.**

CF_22Cu_12Zn exhibit most of the active phase on the external surface of the carbon fibers. On the contrary, the active phase seems to be homogeneous dispersed on the internal fibers and represents a external surface of CF/6.4Cu_3Zn catalyst.

Relatively high CO_2 conversion were obtained, particularly for CF/6.4Cu_3Zn catalyst. However, CF_22Cu_12Zn showed higher selectivity values to CH_3OH. CF/6.4Cu_3Zn catalyst showed a STY value of 0.6 $g_{CH3OH}/h\ g_{Cu}$ at 250ºC under the operation conditions studied.

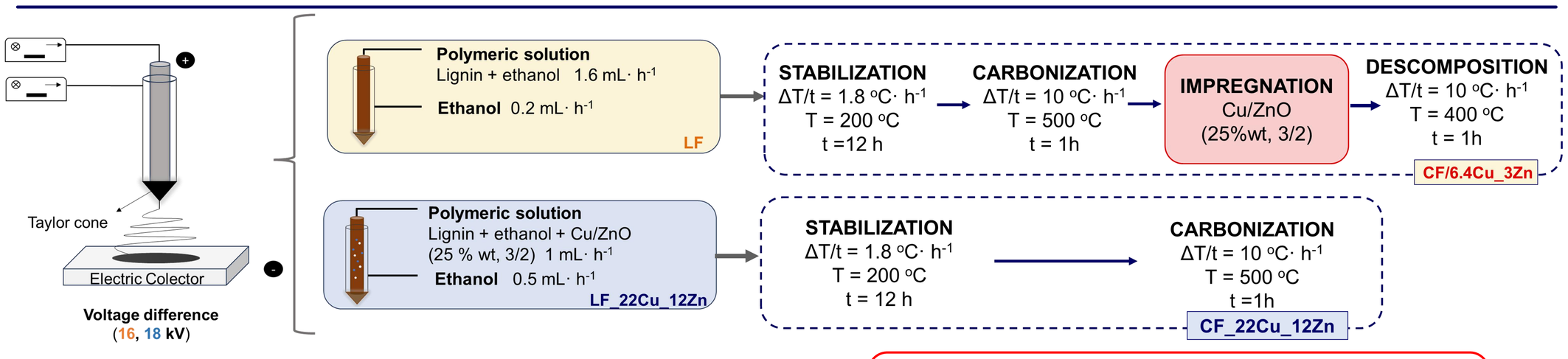
INTRODUCTION



OBJECTIVE

The main objective of this work is to establish the best methodology for incorporating the active phase into carbon nanofibers to produce methanol via CO_2 hydrogenation.

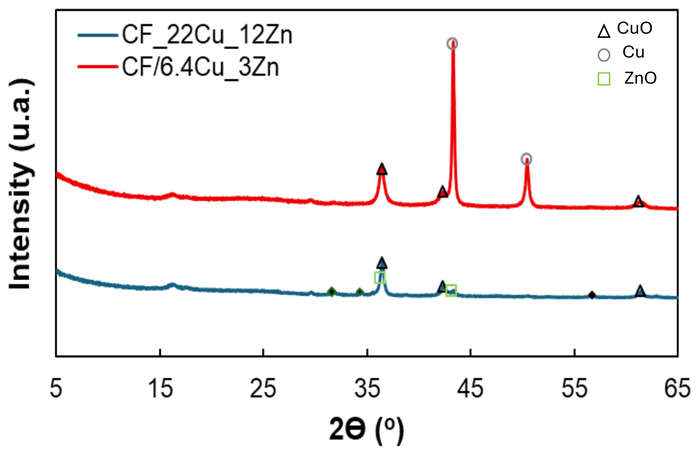
EXPERIMENTAL METHODOLOGY

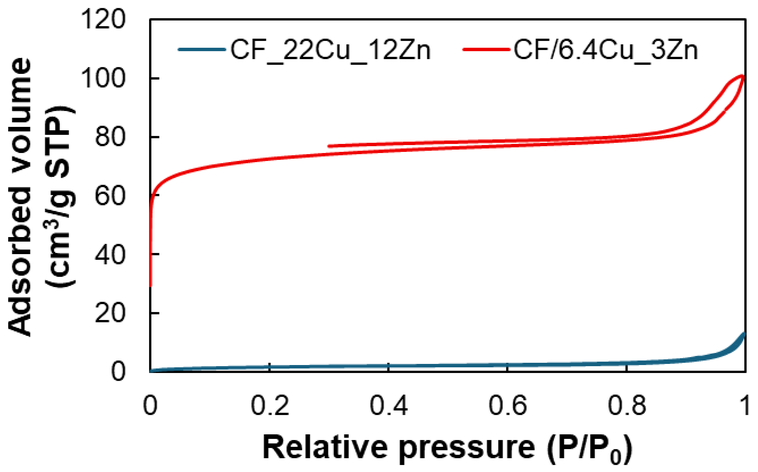


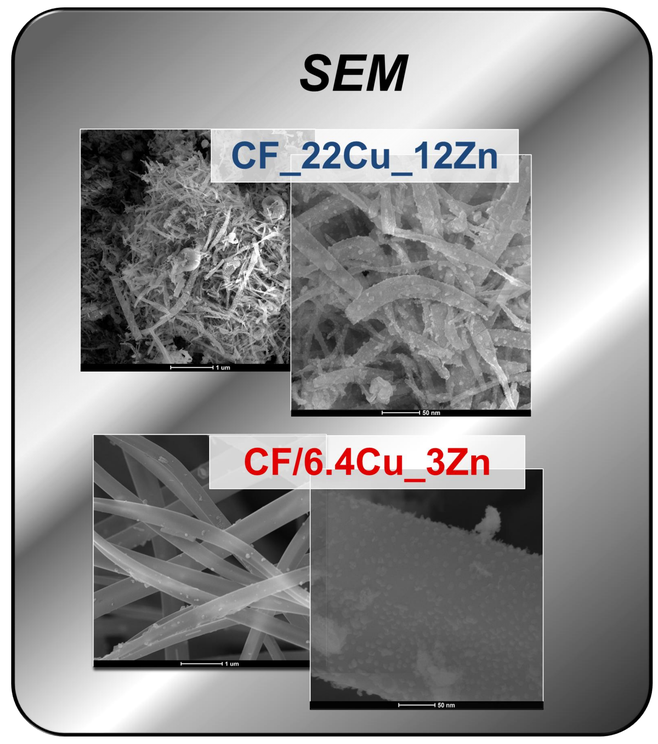
REACTION CONDITIONS

Fixed bed reactor **In situ reduction**: H_2, 400°C, 3 h
Pressure: 30 bar τ : 7.2 g_{cat}·s·mmol^{-1} **H_2:CO_2:N_2** : 3/1/1

CHARACTERIZATION



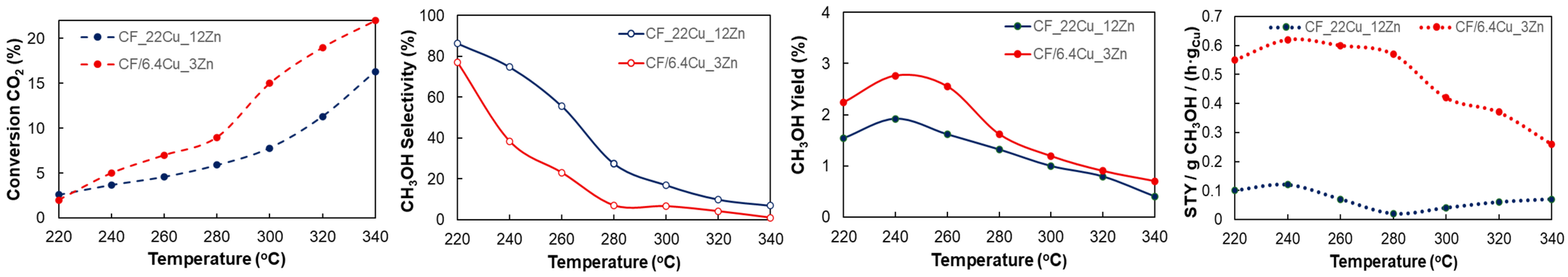




Physicochemical properties of the prepared catalysts

Catalysts	Adsorption-desortion N_2 (-196 ºC) A_{BET} $m^2·g^{-1}$	V_p $cm^3·g^{-1}$	V_{micro} $cm^3·g^{-1}$	Adsorption CO_2 (0 ºC) A_{DR} $m^2·g^{-1}$	V_{DR} $cm^3·g^{-1}$	TG Ash %	XRF Cu %	XRF Zn %	XPS C % at	XPS O % at	XPS N % at	XPS Cu % at	XPS Zn % at
CF_22Cu_12Zn	6	0.01	< 0.01	108	0.05	54.7	27.7	14.8	34	19.1	12.7	22.0	12.0
CF/6.4Ccu_3Zn	279	0.14	0.10	335	0.16	13.5	6.4	4.2	70.2	16.9	2.5	6.4	3.0

REACTION – CO_2 hydrogenation to methanol



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