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Magnetic activated carbons from biomass wastes from the food industry. Strategies in the bioenergy field

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Introduction

This work focuses on the study of magnetic activated carbons (MACs or MPACs) obtained by activation of the physical mixture of anhydrous $FeCl_3$ (activating agent) and chestnut shell wastes (CH) or their biochar (CHP) as adsorbent precursor. The physical mixing between the activating agent and the precursor avoids the impregnation step, a more complex methodology. The possible application of MACs and MPACs in the separation of gas mixtures and biogas upgrading will be tested.

Chestnut shells waste (CH)

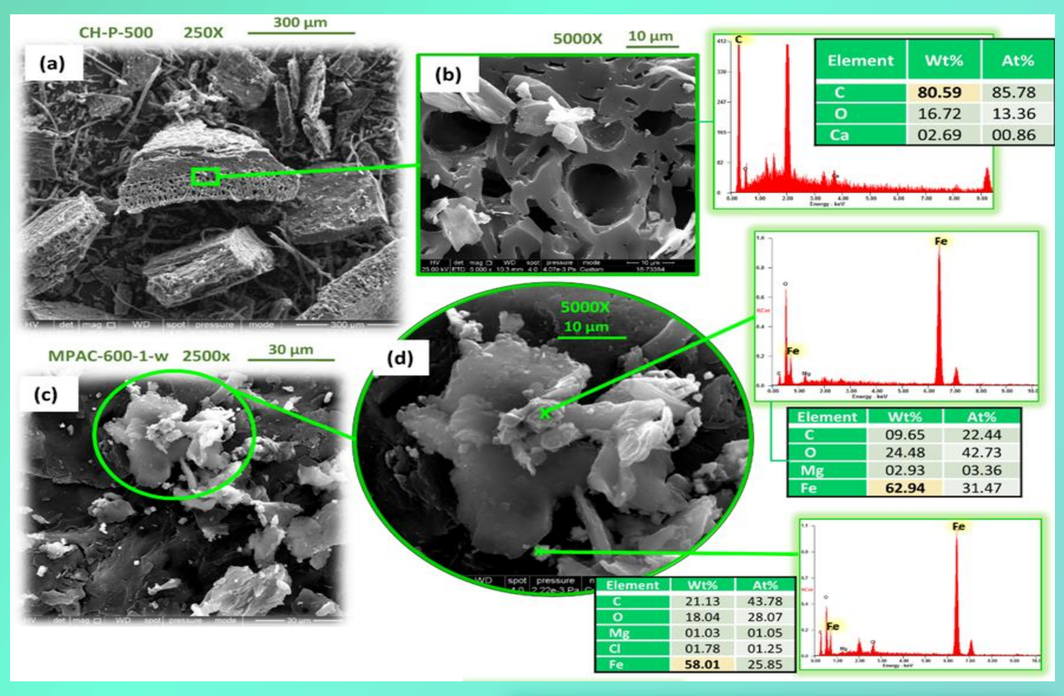
Industrial biowaste (CH) or biochar of Industrial biowaste (CHP)

+ $FeCl_3$ anhydrous

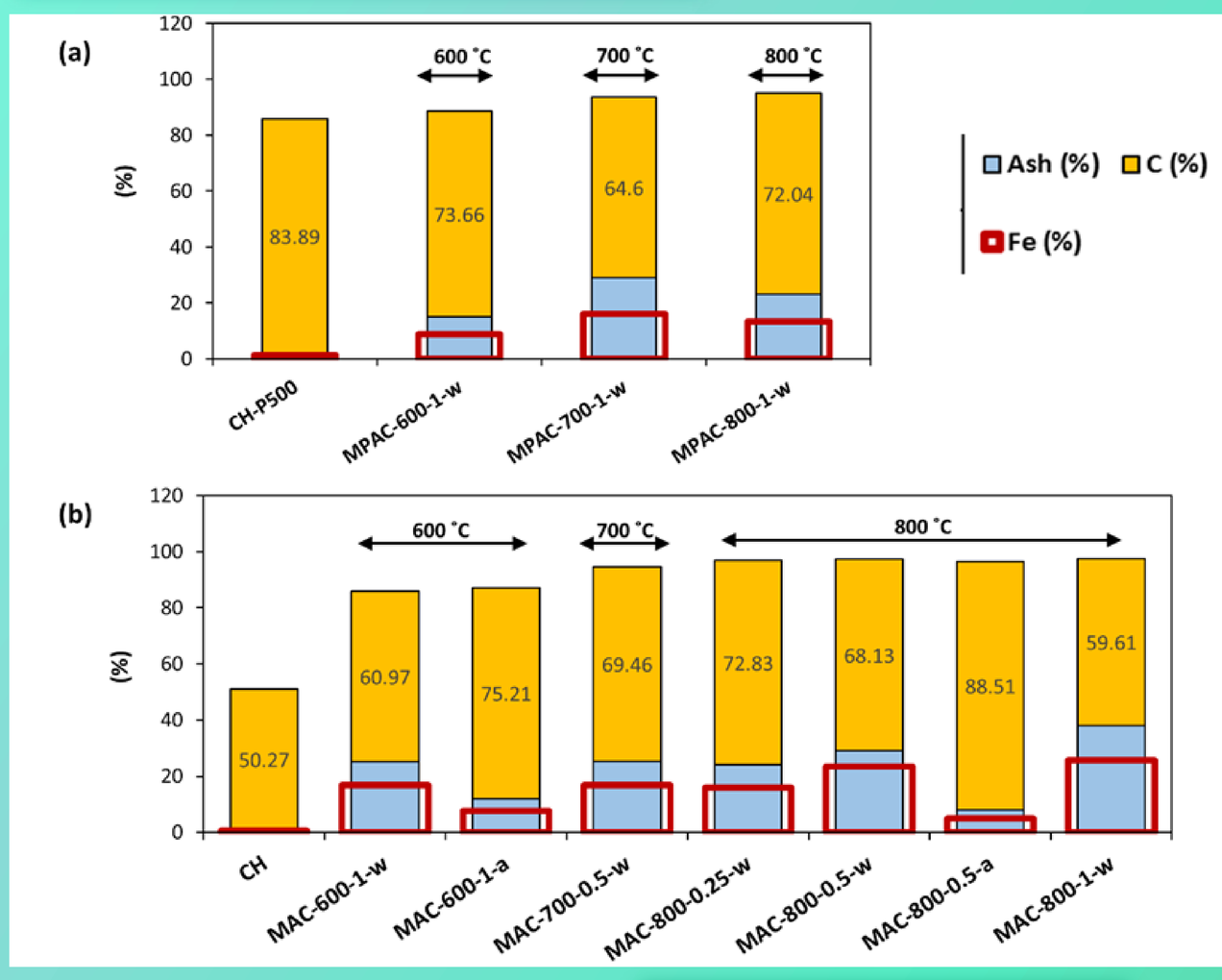
= MAC or MPAC (Magnetic Activated Carbon)

Pyrolysis step	Precursor	Material obtained	T(°C)	Mass ratio $FeCl_3$: CHP $FeCl_3$: CH	Washing step
✓	CHP	MPAC	600-800	1:1	w
✗	CH	MAC	600-800	0.25:1 0.5:1 1:1	w a

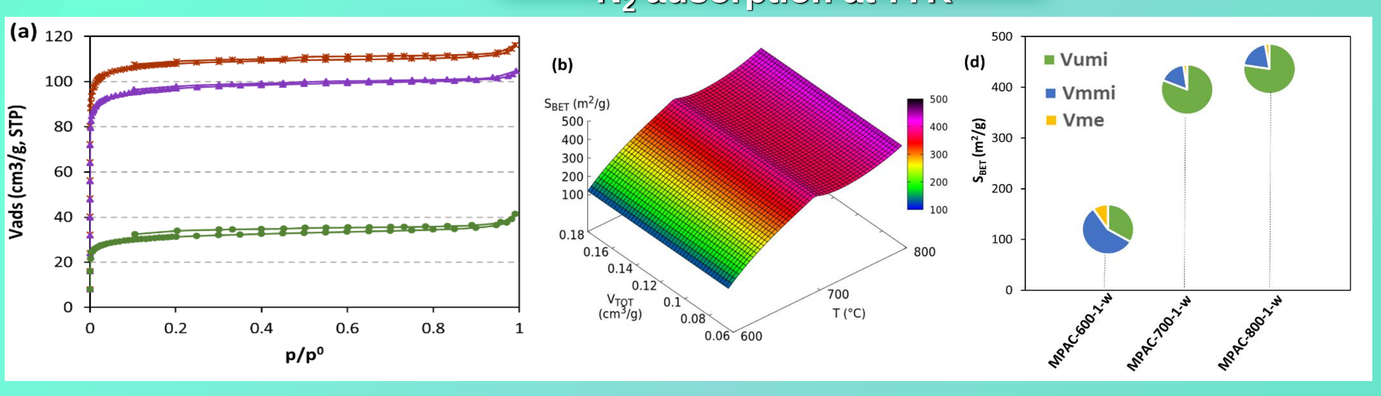
w : water a : acid



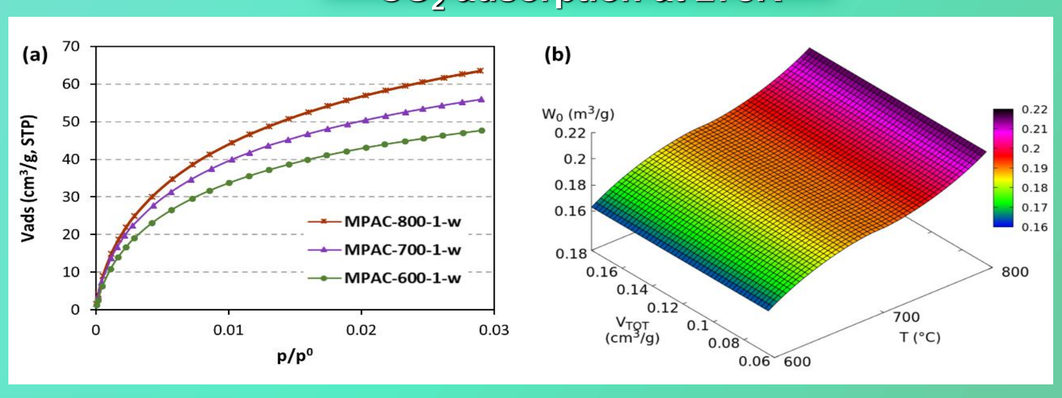
Results & Discussion



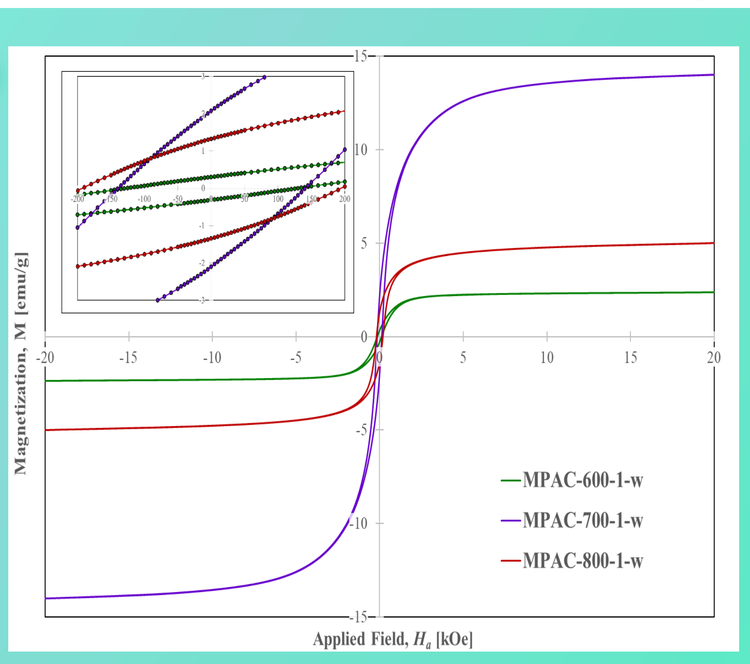
N_2 adsorption at 77K



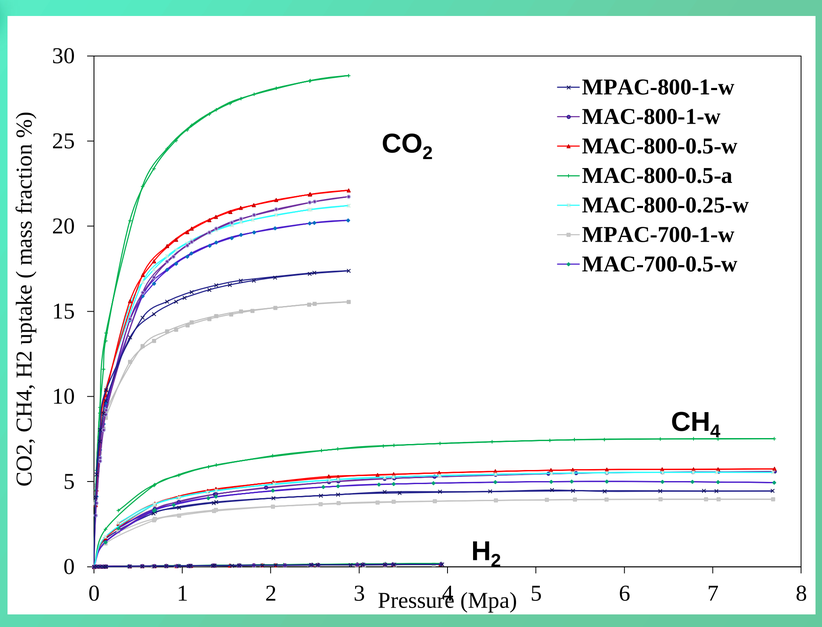
CO_2 adsorption at 273K



Vibrating Sample Magnetometer

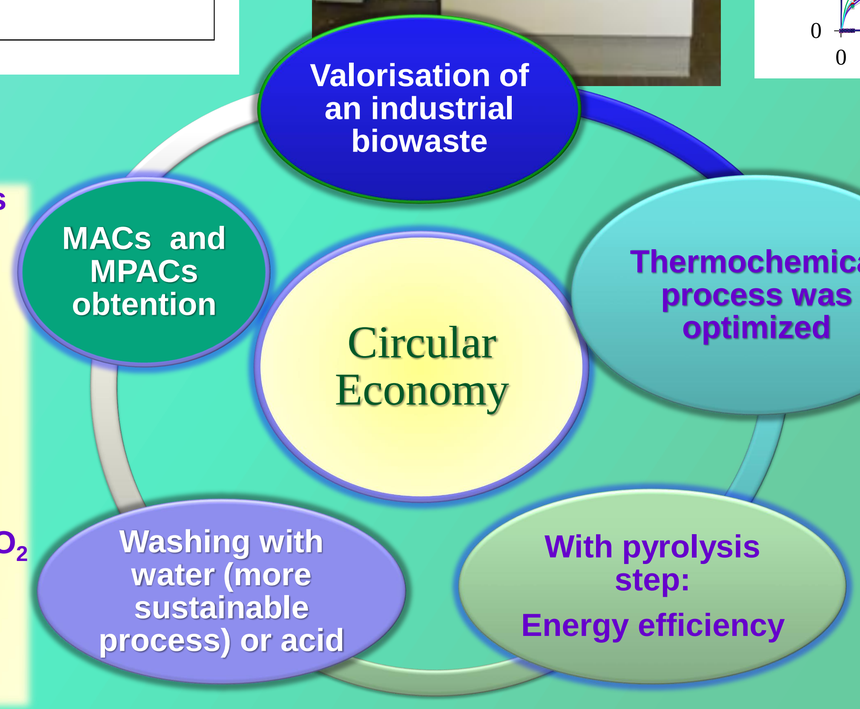


High pressure balance



Conclusions

- ✓ CH or CHP was an appropiate precursor for obtaining MACs or MPCAs.
- ✓ Chemical activation using $FeCl_3$ as activating agent is a method effective in the magnetic adsorbent obtention.
- ✓ The MACs or MPACs showed a good selectivity to CO_2 adsorption, moderate for CH_4 and insignificant for H_2.
- ✓ MACs and MPACs obtained resulted good candidates for CO_2 capture and gas storage
- ✓ Multiple environmental applications



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