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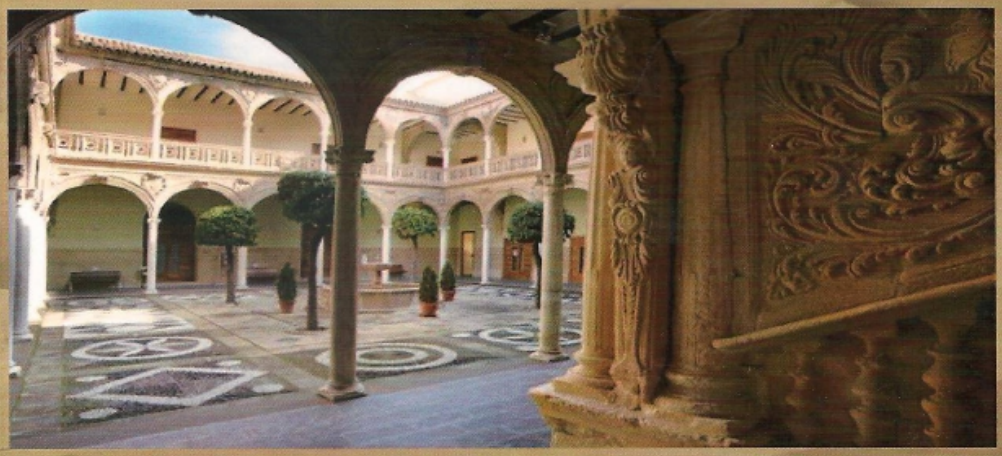

Resúmenes

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HYDROTHERMAL CARBONIZATION – A ROUTE FOR NEW ADSORPTIVE MATERIALS PRODUCTION AND CHARACTERISATION

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1. Introduction

In recent years, the lack of new sources of energy, together with an environmental crisis and the growing of energy consumption made the search for new, cheap, non-toxic and environmental sustainable carbon materials crucial in the near future. During the hydrothermal carbonization process (HTC) carbohydrates or complex lignocellulosic materials are converted under self-generating pressure to carbon materials using only water at mild temperatures, usually below 220ºC.

The present work reports the use of fructose and chitosan as precursors for the production of carbon materials by HTC, which were subsequently activated to produce activated carbons (AC). Selected samples were used to study the adsorption of metformin from simulated gastric and intestinal fluids.

2. Experimental

The precursor was mixed with water at a ratio of 1:6 (w/v) and allowed to stir for one hour. The mixture was then transferred to an autoclave and placed at 200ºC during 24h.

The obtained carbons were washed with distilled water and submitted to physical activation at 800ºC under CO_2 flux or chemical activation with $CaCO_3$, using variable times of activation.

All the materials were characterized by infrared spectroscopy (FTIR), nitrogen adsorption at 77K and elemental analysis (EA). For the selected samples it was also performed temperature programmed desorption (TPD) and scanning electron microscopy (SEM) analysis.

3. Results and Discussion

The SEM analysis revealed HTC with a very regular and spherical structure, with increasing aggregation degree with the extent of carbonization. According with FTIR analysis, the AC prepared from chitosan showed vibrational modes related to amine groups, alcohol, aldehyde and ether. Regarding samples obtained from fructose the main groups were ketone and alcohol. The elemental

analysis supported the identification of amine groups in chitosan samples by showing the presence of 6% in nitrogen content.

The materials are essential microporous, with nitrogen isotherms of type 1 (IUPAC classification) with a horizontal well-defined plateau. The calculated BET apparent surface area ranges between 418 and 1400m^2g^{-1}. All samples have relatively low external areas, between 7 and 68m^2g^{-1} and pore volumes between 0.18 and 0.62cm^3g^{-1}.

The metformin adsorption showed a better performance for samples prepared from fructose, either for physical activation or for chemical activation. The obtained results compares well with other results for commercial carbons or lignocellulosic carbons obtained from traditional physical activation process.

These results shows the validity of the hydrothermal processes for the production of carbon materials in which characteristics have interesting potential in the adsorption process, namely for CO_2 capture or pollutant adsorption.

4. Acknowledgments

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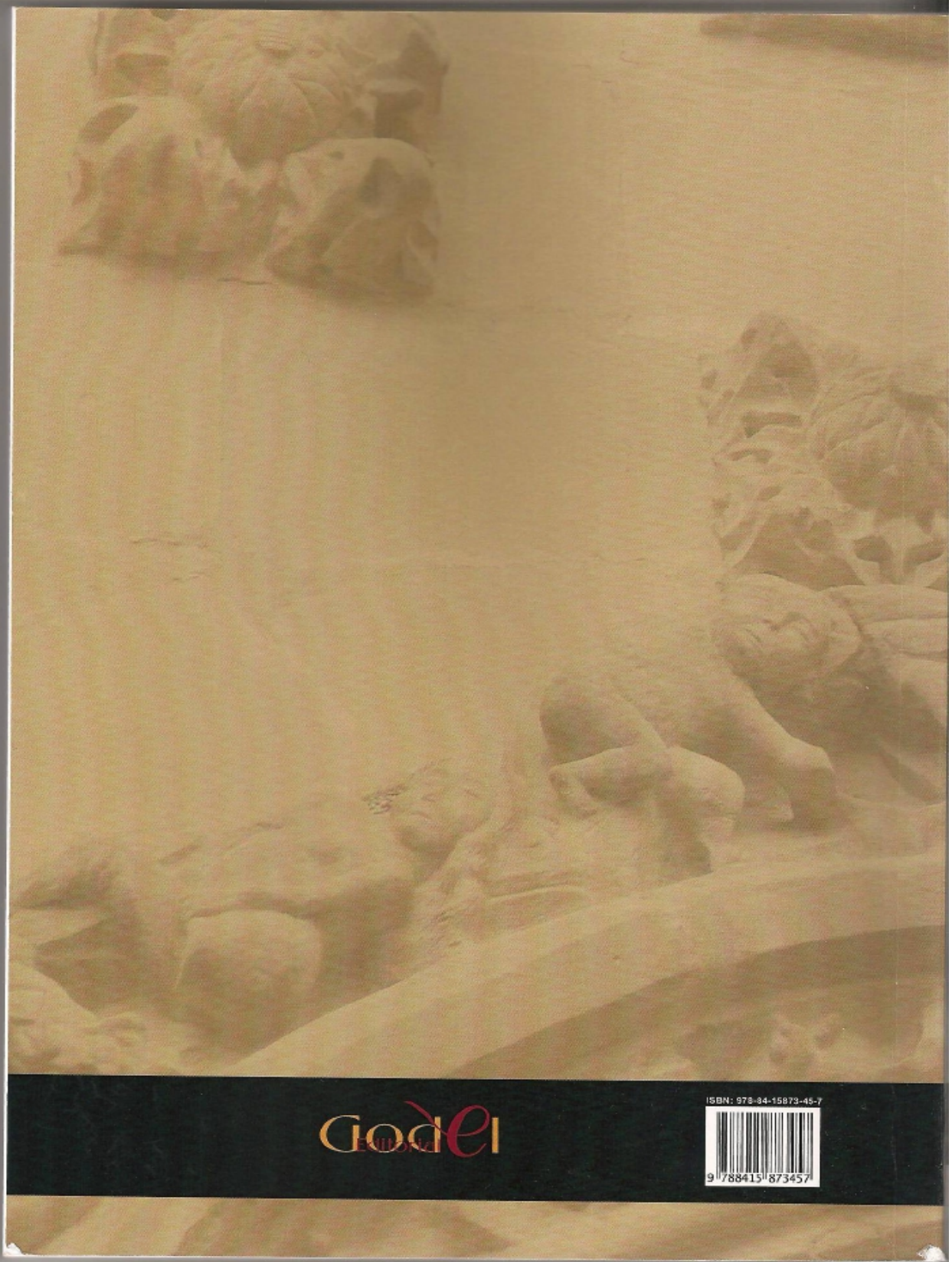

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