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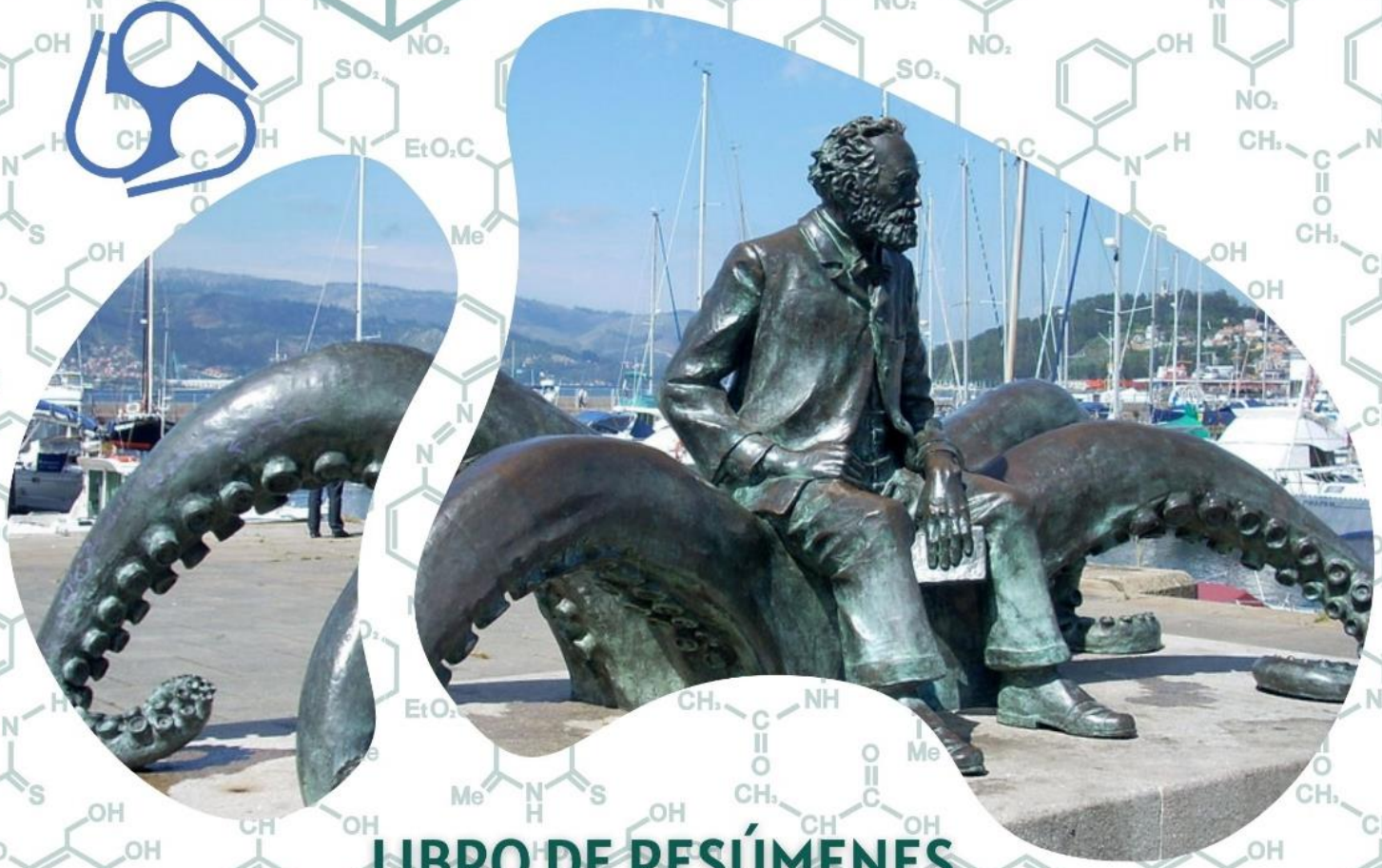

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Synthesis and Characterization of Activated Carbons, Geopolymers, and Carbon Nanotubes from Waste-Derived Sources

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Circular Economy implies strategies for waste valorization and reuse to produce higher-value products [1]. In this context, exhausted olive pomace, a waste biomass derived from olive industry was used to synthesize activated carbon (AC) through slow pyrolysis, followed by activation with CO_2 to optimize the adsorbent's porosity. The pyrolysis furnace was initially maintained under an inert atmosphere with a nitrogen flow rate of 100 NmL/min, considering three different temperature stages reached through the application of a heating ramp of 5ºC/min up to 400°C and 600°C (maintained 1 hour each) and up to 800°C. Activation with CO_2 occurs in the first hour at this temperature, followed by 3 hours in a nitrogen atmosphere, completing the process in 9 hours. The geopolymer (GP) was synthesized using 10 g of fly ash, a byproduct of the combustion of municipal solid waste, mixed with an alkaline solution, a mixture of 5,67g of sodium silicate and 2,27g of sodium hydroxide (10M), to initiate the geopolymerization reaction. The synthesis of carbon nanotubes (CNTs) was based on the methodology of Díaz de Tuesta *et al.* [2], by chemical vapor deposition with plastic waste as the precursor. The results obtained for textural characterization are presented in Table 1. AC showed the highest surface area (527 m^2/g) and a pore volume of 0.318 cm^3/g, can be advantageous for adsorption, while CNT functions effectively as a catalyst despite its lower surface area. Acid-base characterization showed that AC possesses high basicity (1250 µmol/g), enhancing its ability to adsorb acidic contaminants, while CNT and GP demonstrated balanced acid and basic properties, with point of zero charge (pHpzc) values of 9.86 for AC, 6.9 for CNT, and 7.6 for GP. Elemental analysis (CHNS) revealed that AC contained 63.0% C, 0.8% H, 18.0% O, and 16.4% ash. CNT, in contrast, had a higher carbon content of 92.5% and 6.0% ash.

Table 1. Textural properties analysis for the materials

Sample	S_{BET} ($m^2 g^{-1}$)	$S_{Langmuir}$ ($m^2 g^{-1}$)	S_{ext} ($m^2 g^{-1}$)	S_{mic} ($m^2 g^{-1}$)	V_{mic} ($mm^3 g^{-1}$)	W_{mic} (nm)	V_{total} ($cm^3 g^{-1}$)
AC	527	782	33	749	269	1.43	0.318
GP	30	232	6.7	23	0	0	0.068
CNT	66	596	17.3	48.7	0	0	0.172

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References

[1] V. Acevedo-García, E. Rosales, A. Puga, Separation and Purification Technology, 242 (2020) 116796
[2] J. Diaz de Tuesta, A. Silva, F. Roman, Catalysis Today, 419 (2023) 114162