

Área: FIS

## Synthesis of KOH-activated carbon from avocado pit for the removal of emerging pollutants

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### Highlights

Activated carbon with a high specific area, prepared with avocado pits and chemically activated with KOH, will be used to remove emerging pollutants.

### Resumo/Abstract

Adsorption using activated carbon is an effective strategy to address water pollution. The properties of activated carbon depend strongly on the composition of the precursor material and the activation method. Chemical activation is particularly advantageous, as it allows better control over key textural parameters such as specific surface area ( $S_{BET}$ ) and pore volume. Among chemical activating agents, KOH is known to produce activated carbons with exceptionally high  $S_{BET}$  values. In this study, three activated carbons (AC1, AC2, and AC3) were synthesized using different carbon-to-KOH ratios (1:3, 1:4, and 1:5, respectively). The goal was to identify the activation condition that maximizes the specific surface area. The  $S_{BET}$  values obtained were 1062 m<sup>2</sup>/g for AC1, 1940 m<sup>2</sup>/g for AC2, and 809 m<sup>2</sup>/g for AC3. Based on these results, AC2 was selected for subsequent experiments, as it exhibited the highest specific surface area. The results highlight the strong influence of the KOH ratio on surface area. Increasing the ratio from 1:3 to 1:4 significantly enhanced porosity, reaching 1940 m<sup>2</sup>/g for AC2. However, further increasing to 1:5 reduced the surface area to 809 m<sup>2</sup>/g, likely due to structural collapse from excessive activation. This indicates an optimal activation ratio at 1:4, balancing pore development and structural stability.

Fig. 1 shows a well-developed porous structure with large, interconnected pores formed by KOH activation. This morphology enhances surface accessibility and explains the high  $S_{BET}$  of AC2, making it suitable for adsorption processes. The chemical characteristics of the surface were analyzed by FTIR, the results are presented in Fig. 2. It is possible to observe the band of 3315 cm<sup>-1</sup>, attributed to the -OH stretching vibration, followed by the band of 2925 cm<sup>-1</sup>, which represents a C-H bond of an sp<sup>3</sup> carbon. The bands in 1566-1602 cm<sup>-1</sup> were attributed to the C=C stretching common in aromatic rings of lignocellulosic materials. The band at 1020 cm<sup>-1</sup> can be attributed to the C-O stretching present in phenols.

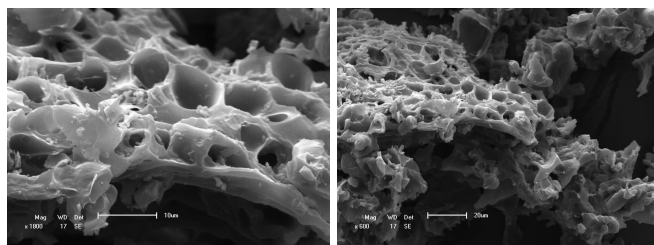


Figure 1: SEM images of AC2

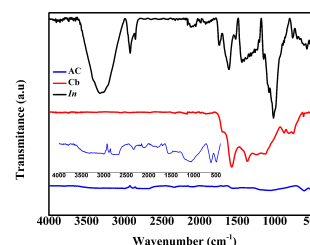


Figure 2: FTIR of material *in nature*, carbonized, and AC2

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