# Transforming Fruit Waste into Climate Solutions: Apple Pomace-Derived Carbons for Methane Adsorption

**João Pedro Correia[1],** Tailane Hauschild[2], Luís A. C. Tarelho[2], Moisés Luzia Pinto[3], Cláudia Nunes[1], Paula Ferreira[1]
[1]*Department of Materials and Ceramic Engineering, CICECO, University of Aveiro 3810-193 Aveiro, Portugal*
[2]*Department of Environment and Planning, CESAM, University of Aveiro, 3810-193 Aveiro, Portugal*
[3]*Department of Chemical Engineering, CERENA, IST, University of Lisbon, 1049-001 Lisboa, Portugal*
joa.fig@ua.pt

The livestock sector is responsible for around 14.5% of global greenhouse gas (GHG) emissions [1], such as methane ($CH_4$) and carbon dioxide ($CO_2$), related to agriculture. Ruminants are the main contributors to GHG emissions within this sector, accounting for around 80% of total emissions, mostly through eructation and exhalation [1-2]. In parallel, the apple processing industry is responsible for the annual production of around 20 million tonnes of waste (e.g., apple pomace) [3]. Within the scope of the FeedValue project (PRR-C05-i03-I-000242), this study aims the valorization of apple pomace for the production of carbon structures with high specific surface area, with potential $CH_4$ and $CO_2$ adsorption. The biomass was subjected to pyrolysis under a $N_2$ atmosphere at high temperature (700 °C and 800 °C), followed (or not) by activation with $CO_2$ or $H_2O$ steam (Figure 1). The influence of the activation agents, as well as the pyrolysis time and temperature, on the morphological and physicochemical properties of the carbons will be discussed, as well as their impact on the adsorption capacity/selectivity of the target gases. Preliminary results revealed a BET surface area of 72 m²/g for a sample pyrolyzed at 800 °C (1 h) without activation, which increased drastically to 552 m²/g with $CO_2$ activation (150 mL/min, 1 h). When the activation time was extended to 2 h, the surface area increased to 682 m²/g. These high specific surface areas foresee the potential of the obtained materials for gas adsorption.

## References

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## Figure

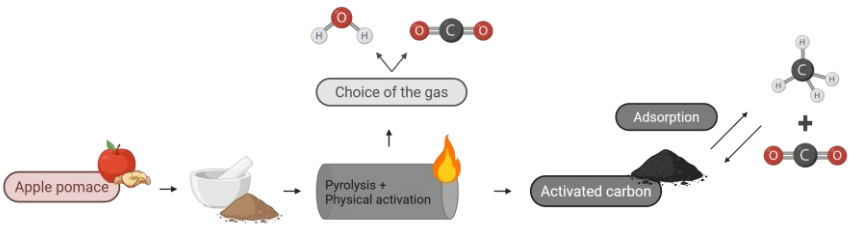


**Figure 1:** Schematic representation of the valorization of apple pomace via pyrolysis and activation ($CO_2$/$H_2O$ steam) for the production of high surface area activated carbon materials for $CH_4$ and $CO_2$ adsorption.

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