Activated carbons prepared from a compost obtained in mechanical biological treatment plants for municipal solid waste processing

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1. Introduction - Activated carbons (ACs) obtained from different organic wastes have been reported in several works, aiming the valorisation of low-cost useful materials [1]. However, organic wastes typically contain inorganic substances, which can be leached away from the prepared ACs when employed in oxidative aqueous conditions. The current study proposes different strategies to produce ACs from a compost obtained (in excess) during the treatment of the organic fraction of municipal solid waste by anaerobic digestion and maturation in waste management sites.

2. Experimental - The ACs were prepared by H_2SO_4 chemical treatment of the compost and carbonization at 800 ºC, adapting the procedure reported elsewhere [1] and exploring three different approaches to avoid iron leaching: (i) preparation of AC from the organic waste obtained as the result of dissolving the compost in cyclohexane at 50 ºC and further separation by evaporation; (ii) preparation of AC from a mixture of compost-glycerol, aiming to encapsulate the inorganic content; and (iii) washing the AC prepared directly from the compost with 0.5 M H_2O_2 at 80 ºC. These samples were tested in the catalytic decomposition of H_2O_2 (0.5 M, pH 3 and AC load 2.5 g/L).

3. Results and Discussion - The extraction of organic content from the compost when using cyclohexane (approach i) was not enough to produce a suitable AC. In contrast, samples were successfully prepared by (ii) and (iii), showing catalytic activity in the decomposition of H_2O_2 (conversions of H_2O_2 higher than 50 % at room temperature after 2 h), the leaching of iron being not detected for the sample obtained by (iii).

4. Conclusions – The valorisation of a compost to produce an active and stable AC catalyst is possible by activation with H_2SO_4, carbonization at 800 ºC and washing with a H_2O_2 solution at 80 ºC.

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5. References

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