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Development of low-cost materials from compost obtained in mechanical biological treatment plants for municipal solid waste: application as catalysts in H_2O_2 decomposition

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The organic waste, after separation from rejected and recyclable waste, is treated by anaerobic digestion and composting, in order to obtain biogas and a compost that can be used in agriculture. However, the current waste management legislation in Europe and expected developments regarding the coming directives on the application of the "End-of-waste" criteria, are leading to barriers on the use of fertilizers resulting from waste [1]. Within this context, the current work proposes an alternative strategy to the valorisation of compost, through the production of high-value materials to be used in catalytic processes. To this aim, a compost obtained from a mechanical biological treatment plant for municipal solid waste was considered. The material was first washed (1 litter of water per 100 g of compost), in order to remove the soluble compounds and suspend solids. Then, two different materials were prepared by carbonization at 400 (C-400) and 800 ºC (C-800). In addition, following the procedure previously described [2], two materials were prepared with H_2SO_4 before and after the carbonization at 800 ºC (C-S-800 and C-800-S, respectively). Finally, the materials were sieved, in order to obtain samples in three different particle size ranges: 0-106 µm (LSp), 106-250 µm (MSp) and higher than 250 µm (HSp). All materials were assessed in H_2O_2 decomposition (Fig.1). As can be observed, conversions of H_2O_2 higher than 80 % at 24 h are obtained with the most of samples (much higher than the conversion obtained without material, ca. 30 %). In addition, the increase of the carbonization temperature results in materials with a catalytic activity greatly increased. On the opposite, the modification with H_2SO_4 shows a negative effect, likely due to an increase of acidity [3].

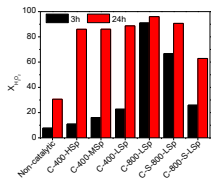

Fig.1. Decomposition of H_2O_2 by using catalysts obtained from compost.

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