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DEVELOPMENT OF CARBON MATERIALS FROM NATURAL PRODUCTS FOR ENVIRONMENTAL APPLICATIONS

J.M. Valente Nabais[1], C. Laginhas[1], P.J.M. Carrott[1], M.M.L. Ribeiro Carrott[1], S. Roman[2], C. Galacho[1]

[1] *Centro de Química de Évora e Departamento de Química, Universidade de Évora, Escola de Ciências e Tecnologia, Rua Romão Ramalho nº 59, 7000-671 Évora, Portugal, jvn@uevora.pt*

[2] *Dpto. de Física Aplicada, Dpto. de Ingeniería Mecánica, Energética y de los Materiales, Universidad de Extremadura, Avda Elvas s/n, 06071 Badajoz, Spain*

The development of carbon materials, namely activated carbons (ACs), to remove mercury and phenol from aqueous medium is reported. Mercury and phenol compounds are two of the pollutants with major environmental impact. Its high toxicity to humans and animal life makes essential the removal of the pollutants before discharge of contaminated wastewater into water bodies.

We have used different types of natural precursors based on agriculture residues to produce activated carbons by carbon dioxide (Ca) and steam (Sa) activation. The precursors, experimental conditions of ACs preparation and sample designations are shown in table 1. Selected samples were also modified by oxidation with nitric acid and TEDA. All samples were fully characterized by SEM, FTIR, DRX, pzc determination and nitrogen adsorption at 77K.

The phenol adsorption onto ACs can be considered reasonably high with maximum adsorption capacity of 2mmolg^{-1}. The modification with TEDA leads to an increase of the phenol uptake, which indicates that the principal adsorption mechanism is based on chemical interactions. Also, it seems that the steam activation produces ACs with more interesting properties for the adsorption of phenol.

Table 1 – Experimental conditions

Precursor	ACs production method	Sample
Almond shell	Ca at 800ºC	A835
Coffee endocarp	Ca at 800ºC	Cf825, Cf864, Cf840, Cf850
Vine shoot	Ca at 800ºC Sa at 700ºC Sa at 800ºC	V840, V870 V744W V823W
Sunflower	Sa at 700ºC Sa at 800ºC Ca at 700ºC Ca at 800ºC	G733W G824W, G838W G742 G819

The pristine and the modified ACs used to remove mercury species form aqueous solutions had proved to have potential to be used for water decontamination as indicated by the mercury uptake up to 2000mgg^{-1}. The mercury species studied were Hg^{2+}, $HgCl_2$ and $HgCl_4^{2-}$. The adsorption mechanism is dependent on the mercury specie and the surface characteristics of the ACs, it ranges from electrostatic to chemical interactions between the mercury specie and the ACs' surface functional groups. All the results will be shown for the first time in detail at MATERIAIS 2011.

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