

Removal of Methomyl by Adsorption on activated Carbon From Aqueous Solution

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The search of new and less expensive precursors, namely natural or industrial wastes, for the activated carbon (AC) production and its use for the wastewater treatment is an important area in environmental sciences. Methomyl, due to its vast use and solubility in water is a potential contaminant of groundwater

Residues of wood and seed of baobab from Benguela region (Angola), were crushed into fragments up to 3mm before the prewash step with an aqueous solution of 20% in H₂SO₄ by period of 24h. The solution was filtered and the remainder was washed with distilled water and then oven dried at 110 ° C.

The Acs' production was done in a horizontal tubular furnace. The precursors were impregnated with H₃PO₄ and KOH and the activation done at 400 ° C under nitrogen flow. After activation, the samples were cooled to room temperature in an inert atmosphere and then removed from the oven and then washed and oven dried. The carbon material has been removed to remove excess chemical agent and other residual substances such as ash.

The precursors were characterized by thermogravimetric analysis and helium pycnometry. The content of cellulose and lignin was done by Agroléico (Porto Salvo, Portugal), using the Portuguese Standards NP2029 and ME-414, respectively. The Acs' samples were characterized by nitrogen adsorption at 77K, FTIR, CHNS-O elemental analysis and determination of the point of zero charge (pzc).

The adsorption of methomyl from liquid phase was performed at 25 ° C under an acidic medium, pH ~ 3. After the 24-hour contact time, the Acs' suspensions were filtered and a residual pollutant concentration determined by UV / Visible spectrophotometry using a PerkinElmer Lambda 850 spectrophotometer at 233nm [1].

The activated carbon samples show apparent surface area between 167 and 395m²/g, pore volume from 0.17 to 0.65cm³/g and mean pore width around 1.08nm. The adsorption of methomyl, a hazardous and problematic pollutant, from aqueous solutions reached the maximum adsorption capacity of 243mg/g at an equilibrium concentration of 1mg/L [2,3].

References

- [1] Mourão, P.A.M.; Laginhas, C.; Custódio, F.; Nabais, J.M.V.; Carrott, P.J.M.; Ribeiro Carrott M.M.L; Fuel Processing Technology 2011,92, 241-246.
- [2] Marsh, H.; Rodriguez-Reinoso, F. *Activated Carbon* Elsevier Science & Technology Books, 2006.
- [3] Thommes, M., Kaneko, K., Nelmark, A., Olivier, J.P., Rodriguez-Reinoso, F., Rouquerol, J., Sing, K.S.W.: Physisorption of gases, with special reference to the evaluation of surface area and pore size distribution (IUPAC Technical Report). Pure Appl. Chem. 87(9-10) (2015) 1051-1069.

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