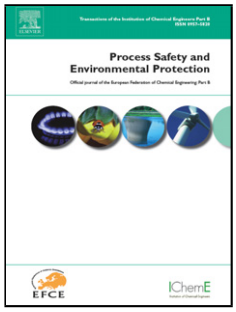

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Highlights

Lignite vs. anthracite: higher lignite revalorization
Alkaline hydroxides activation produced good coal-based activated carbons
High surface area (S_{BET} = 1839 m^2 g^{-1}) was obtained by the anthracite-based AC
The presence of sulphur groups (in MAC) improves the adsorption of salicylates
Adsorption of pharmaceutical pollutants depends on their hydrophobicity

Removal of pharmaceutical industry pollutants by coal-based activated carbons

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Abstract

Several studies have demonstrated the presence of pollutants from the pharmaceutical industry in surface and groundwater. The main inputs of pollutants come from households, hospitals and the industry and many of these compounds are not completely removed by WWTPs. The purpose of this research is to study the adsorption of paracetamol, phenol and salicylic acid using coal-based activated carbons. A lignite from Mequinenza (M) and an anthracite from Coto Minero Narcea (CN) from Spain were chemically activated with alkaline agents obtaining two activated carbons (MAC and CNAC). Two commercial activated carbons widely used in water treatment (F400 and NPK) were selected for comparison purposes. The activated carbons were characterized and the results showed a high surface BET (1839 m^2 g^{-1}) and total pore volume (0.83 cm^3 g^{-1}) on CNAC while MAC was characterized by high sulphur content (6%). Vapour isotherms indicated a chemical interaction between the surface functional groups of MAC and the water molecules. The highest uptake of the three pharmaceutical compounds was achieved by CNAC. MAC showed a high affinity for anion salicylates (at pH 4-8). The maximum adsorption capacity of the pollutants onto the activated carbons followed the order salicylic acid > phenol > paracetamol which can be explained by hydrophobicity.

Keywords

Pharmaceutical-pollutants, Modelling-adsorption, Activated-carbon, Lignite, anthracite

#body

1. Introduction