

Adsorption of sodium diclofenac on activated carbon, oxide and iron(III) hydroxide

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Abstract

The adsorption of sodium diclofenac on activated carbon, iron(III) oxide and on freshly precipitated iron(III) hydroxide has been studied. The amount of adsorbed diclofenac is determined from change in concentration of the solutions before adsorption and after adsorption by spectrophotometric method. In this paper, the analytical wavelength for diclofenac sodium is $\lambda = 276$ nm. All measurements of the optical density of the diversifenac solutions is carried out at $\lambda = 276$ in further. It was shown that the adsorption capacity of iron(III) esters is higher than that of activated carbon. Iron oxide is a hydrophilic sorbent, and activated carbon is hydrophobic and naturally iron oxide sorbs the electrolytes better, such as sodium diclofenac. A major disadvantage of iron oxide is its low specific surface area, therefore to remove from the water the same amount of diclofenac by iron oxide because of its low specific surface, it takes ten times more than activated carbon, which obviously isn't beneficial. We proposed using freshly precipitated iron(III) hydroxide as the sorbent considering that activated carbon and iron oxide are expensive sorbents. Iron salts are used in practice as coagulants in the purification of industrial and domestic wastewater. The effect of pH on the sorption of sodium diclofenac on the ash of freshly precipitated iron hydroxide was studied. The following pH values is chosen in the work: 3, 6 and 12 corresponding to the region of high positive, neutral and high negative charges of the iron(III) hydroxide surface. The sol of freshly precipitated iron hydroxide was prepared directly in a solution of diclofenac sodium by the hydrolysis of iron nitrate. The sorbent, obtained in this way with particle sizes of 10-100 nm has a larger specific surface area than activated carbon.

Comparison of sorption isotherms of sodium diclofenac on hydroxide and iron(III) oxide shows a higher sorption capacity of freshly precipitated iron hydroxide, which is due to a very large specific surface area and a large number of active adsorption centers.

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