Adsorption Mechanism of Arsenite on Fe $^{+3}$ Impregnated Activated Carbon

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In the present study, removal of arsenite (As(III)) ions from water/wastewater by adsorption on Fe $^{+3}$ impregnated activated carbon is investigated. Laboratory experiments were carried out to analyze removal capacity of the adsorbents, to achieve adsorption isotherms and kinetic parameters. The adsorption was strongly dependent on pH, adsorbent dose and arsenic concentration. A series of batch adsorption tests were conducted to evaluate two adsorbents efficiency correlated with pH ranges. The adsorption studies were carried out by adding 0,1 g adsorbent to 50 mL of As(III) working solution at concentration 5 mg/L and pH (ranging from 3.0 to 10.0).
Arsenic concentrations of the solutions were measured with a Varian, Vista-Pro CCD simultaneous inductively coupled plasma ICP-OES spectrophotometer. For initial concentration of 5 ppm, the maximum uptake of arsenic reached respectively 77 % for an adsorbent dose of 0.1 g. The results indicated that arsenite removal by Fe^{+3} impregnated activated carbon was affected by the pH of the solution and it seemed that maximum adsorption was achieved in the pH range of 4-6. However, for the virgin activated carbon the maximum % of removal of arsenite was found ~49% at pH 7, respectively when 0.1 g adsorbent was used at the As_0 5 ppm.
The surface area, pore size and volume of the virgin activated carbon were measured under nitrogen atmosphere using a Nova-BET Surface Area Analyzer supplied by Quantachrome Corperation. The multipoint BET analysis was performed to obtain surface area, pore size and volume. The results are given in Table 1.

Table 1: Physical properties of virgin active carbon

Type	Unit	Activated carbon
BET-surface area	m^2/g	1048
BJH method adsorption pore volume	cc/g	0,51
BJH method adsorption pore size	Å	26,69

Additionally, Leo Supra 35VP Field emission scanning electron microscope, Leo 32 and electron dispersive spectrometer software was used for images of virgin activated carbon. The SEM image indicates that the surface of the activated carbon is rough which is expected and there are few macrospores areas as can be seen in Fig. 1.
In summary, for the purpose of an economical water treatment process, removal of arsenic from water/wastewater by adsorption using virgin activated carbon and Fe^{+3} impregnated activated carbon were investigated.

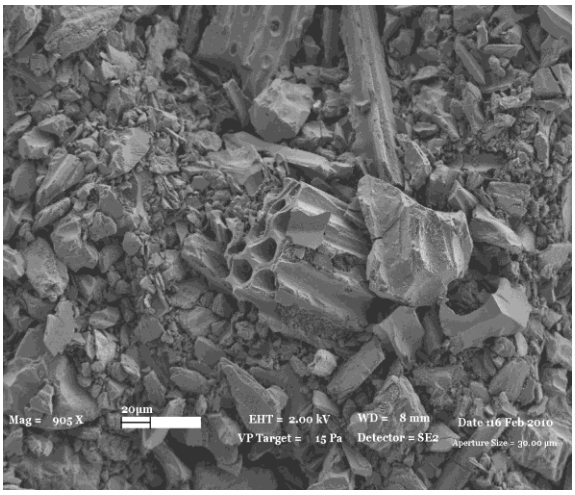

Fig. 1 Sem image of virgin activated carbon