Green synthesized copper nanoparticles into granular activated carbon of babassu coconut by *Hibiscus Sabdariffa* flowers for removal of nitrate

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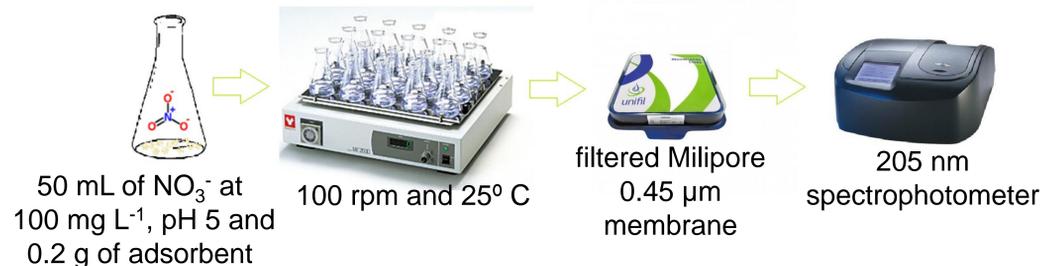
Introduction

Nitrogen in the form of nitrate in drinking water can cause diseases such as cancer and methemoglobinemia. Various techniques of removal of nitrate ion present in water are studied such as adsorption. The surface of coal can be improved by means of impregnation and funcionalization of metals, by the biological method using plant extract. Thus, the purpose of this study was to impregnate copper nanoparticulas on granular activated carbon babassu coconut (GAC) for green synthesis method using aqueous extract of *Hibiscus sabdariffa* (Hibiscus), in order to improve the functional properties of coal and its adsorption of nitrate ion.

Materials and Methods

Green synthesized copper nanoparticles into granular activated carbon of babassu coconut by *Hibiscus Sabdariffa* flowers:

40 g of granular activated carbon of babassu coconut

20 mL of copper sulfate 1.5%

40 mL: 15 g of the dried flowers of hibiscos in 250 mL of water at 80ºC for 1 hour

Adsorption assays:

50 mL of NO_3^- at 100 mg L^{-1}, pH 5 and 0.2 g of adsorbent

100 rpm and 25º C

filtered Milipore 0.45 µm membrane

205 nm spectrophotometer

Results: Characterization of GAC and IGAC

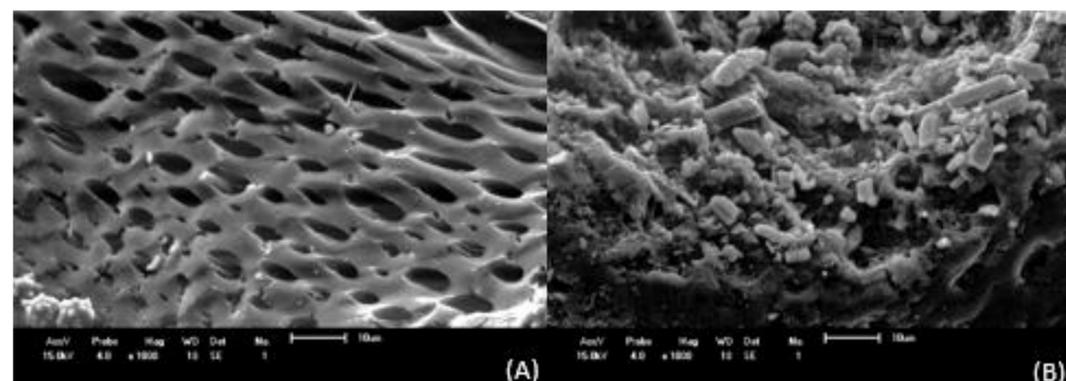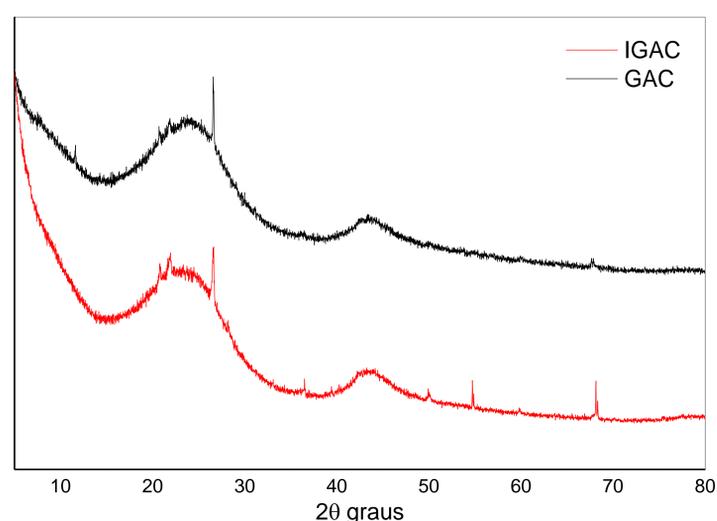Figure 1: x-ray for Difratogramas GAC and IGAC.

Figure 2: Micrograph obtained by SEM of adsorbents (A) GAC (B) IGAC.
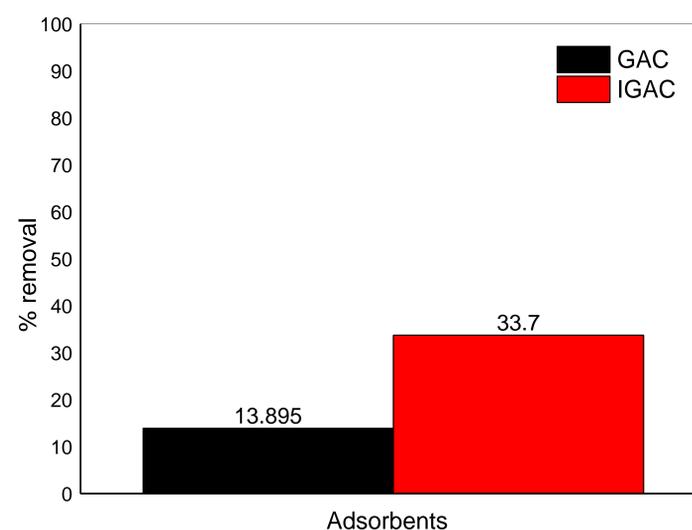
Results: Adsorption assays

Figure 3: Nitrate removal for GAC and IGAC. (mass of adsorbent: 0.2 g, pH: 5, temperature: 25° C, time: 3 hours, rotation: 100 rpm).

Conclusions

The characterization confirmed the successful synthesis of copper nanoparticles since peaks related to the copper oxides were detected by XRD. Also, SEM confirmed the difference between the surface of both pure and impregnated GAC, suggesting the presence of some nanoparticles.

For adsorption results, the present work indicated that the impregnated GAC is a promising material for removal of nitrate, where the impregnation of copper oxide increased the efficiency of nitrate removal by more than 240%, compared with the pure GAC, at same experimental conditions.

Acknowledgement