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CELLULOSIC MATERIAL DERIVED FROM MAIZE STALK FOR Cu(II) and Fe(III) REMOVAL

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Introduction

Due to their bioavailability, various vegetable waste such as agricultural and industrial by-products (referred to in the literature as bio-adsorbents) can be used mainly for the retention of metallic cations. Thus, these biomaterials have the ability to remove metallic cations with functional groups that are in their structure but as well as through different mechanisms of physical sorption or the porosity of the biomaterial. Furthermore, the advantage to use this vegetable waste in environmental pollution reduction processes is primarily an economic justification because in our country there are significant quantities of such agricultural waste that could be used for this purpose with relatively low operating costs and having the major advantage because are cheap and easy to use. These methodologies can be applied for the following purposes, such as depollution, recovery, revaluation and concentration to determine them. The goal of this study was to use this maize stalk in retention of Cu(II) and Fe(III) from synthetic solutions and in the second part it was proposed to the treatment of waste water from mining exploitations as well as in the greening of a tailings pond can containing mining sediments.

Materials and methods

The ICP-MS Aurora M90 Bruker spectrometer was used to detect the metallic concentrations from synthetic solutions and from waste water. In our experiment batch method was used. The biomaterial was prepared as follows, maize was collected at maturity, crushed at different sizes and left to swollen for 2 hours. After this step, the solution was decanted and the maize stalk was washed with ultra-pure water until the colour and other impurities were completely removed. The maize stalk was then sieved through a standardized sieve from 2.0, 1.0, 0.25, 0.12 up to 0.063 mm. Prior to use, the shredded maize stalk was treated with 4M HCl for 2 hours and washed to a neutral pH of the decanted solution.

It was evaluated a filonian system whose mineralization is predominant by polymetallic, copper and gold one from the mining exploitation located in the N-V Baia Mare of mining basin to the Tyuzosa geographic perimeter of the Nistru area of Tautii Magheraus town. Following the mining process, the resulting waste waters are discharged to the mouth of the Tyuzosa gallery +334 m with a flow of 15-20 m^3/h in the Valea Baitei after a conventional purification with $Ca(OH)_2$. In order to study the environmental impact of waste sediments storage, different sterile samples were taken

from the studied area. This tailing pond is located on Valea Mealului at about 3 Km downstream of the processing plant Certezu de Sus located in the southern part of the Metalliferous Mountains.

Results and conclusions

The effect of contact time and initial concentration (figure 1) was taken into account when assessing the sorption capacity of the maize stalk by synthetic solution.

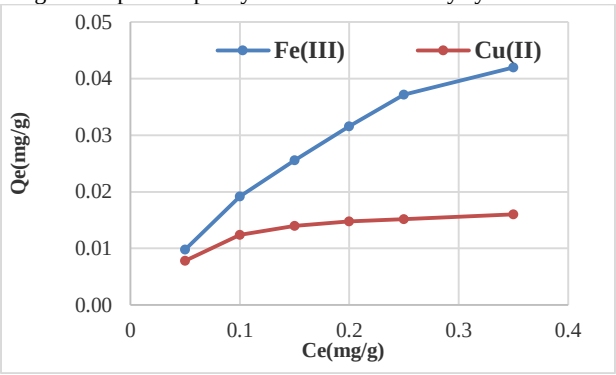

Figure 1. Experimental isotherms for Cu(II) and Fe(III) retained by maize stalk activated

In addition, the sorption data at equilibrium was characterized by the Langmuir and Freundlich sorption isotherm models. The high value of correlation coefficients to the Langmuir isotherm (R^2=0.9858 for Fe(III) and R^2=0.9995 for Cu(II)) confirms their retaining on the homogeneous surface of the biomaterial until saturation. The maximum sorption capacity Q_e(mg/g) was determined based on the Langmuir equation to 0.017 mg/g Cu(II) and 0.043 mg/g Fe(III). On the other hand, the Langmuir b(L/mg) constant can be correlated with half the saturation capacity of the adsorbent monolayer. The b(L/mg) value was calculated as 0.009 and 0.014 for Fe(III) and Cu(II). Moreover, the values of the correlation coefficients for the Freundlich isotherm were lower than for the Langmuir model, which suggests a low retention on the heterogeneous surface of the biomaterial. On the other hand, from the results obtained to the sediment samples it was observed can the maize stalk has higher sorption capacity for Fe(III) than for the Cu(II), behaviour observed in all cases of synthetic solutions. Thus, the maize stalk was retained 47% Fe(III) and up to 65% Cu(II) from mining waste water.

To conclude, the maize stalk can be used as nonconventional material to selective removal Cu(II) and Fe(III) from different polluted waste water.

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