

Vinasse biosorption on shellfish shells *Phacoides pectinatus*

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Introduction

Vinasse is a residue produced in large-scale by alcohol industry. It is a dark colored suspension, corrosive, with a very strong unpleasant odor and great polluter potential¹. Shellfish shells are residues from shellfish culture, that have any commercial value². The improper disposal of both residues can induce serious environmental pollution problems. In this study, *Phacoides pectinatus* crushed shellfish shells, known in the Brazil northeast region as “Lambreta”, were used as biosorbent to reduce the vinasse polluter charge. There were investigated the biosorption effect on vinasse pH, alkalinity and electrical conductance. It was done also a study on adsorption equilibrium and adsorption kinetic of H⁺ ion by the biosorbent³.

Results and Discussion

The vinasse was obtained from a bioethanol and sugarcane brandy industry located in Capela city, Sergipe, Brazil. The shellfish, *Phacoides pectinatus*, were acquired at the municipal market of Aracaju city, Sergipe, Brazil. The vinasse physico-chemical characterization results are shown in Table 1.

Table 1. Vinasse physico-chemical properties

Parameter	Unit	Result
pH	-	4.05 ± 0.02
Conductance	mS cm ⁻¹	5.44 ± 0.03
Alkalinity due OH ⁻	mg L ⁻¹ CaCO ₃	Absence
Alkalinity due HCO ₃ ⁻	mg L ⁻¹ CaCO ₃	Absence
Acidity	mg L ⁻¹ CaCO ₃	218 ± 9
Chloride	mg L ⁻¹ Cl ⁻	1,069 ± 9
Total dry solids	mg L ⁻¹	12,300 ± 22

Batch adsorption experiments were carried out in 250 mL Erlenmeyer flasks containing 0,500 g of biosorbent (size 2.36 to 4.75 mm) and 120 ml of vinasse. The containers were kept in a dark place and shaken manually once a day. The variations of pH, alkalinity and electrical conductance were accompanied over the time. It was observed that the pH vinasse has increased more than one unit until the seventh day and thereafter remained constant. The electrical conductance has increased linearly over the time. These effects are shown in Figure 1.

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The alkalinity due to HCO₃⁻ began to be detected after seventh day and reached 833 mg.L⁻¹ of CaCO₃ at the sixteenth day.

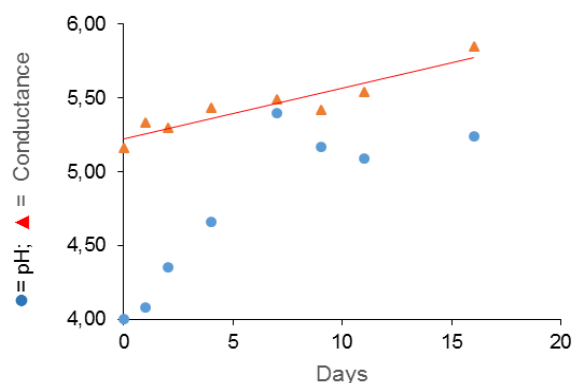


Figure 1. Effect of biosorption on vinasse pH and electrical conductance.

Adsorption experiments conducted on a shaker table at 200 rpm for 2 days and with size shells between 0.6 - 1.18 mm have shown that pH vinasse increases to 5.94, and the electrical conductance reaches 6,39 mS cm⁻¹.

Conclusions

The contact between the *Phacoides pectinatus* crushed shellfish shells and the vinasse increases the pH vinasse until almost two units, depending on biosorbent particle size. It was observed generation of alkalinity and a gentle rise of electrical conductance. This result indicates that the increasing of pH vinasse is related to a reaction between the H⁺ vinasse and the carbonate ion from shellfish shells resulting HCO₃⁻ ion.

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