Impact of different concentrations of alginate in alginate-yeast hydrogel biosorbent

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Keywords: Brilliant green; dye; biosorption; immobilization; wastewater

Hem. Ind. **78(1S)** 70 (2024)

Available on-line at the Journal web address: http://www.ache.org.rs/HI/

INTRODUCTION: Dyeing industry wastewater is one of the major environmental problems. Biosorption technology is regarded to be inexpensive and ecologically beneficial. Spent brewery yeast used in this research is proposed as a promising adsorbent [1] but free cells are unsuitable due to separation problems which leads to immobilization as an important part of the practical application of biomass biosorption. Alginate is well known; widely used and inexpensive material and the extrusion technique is the economical and ecofriendly encapsulation technique for immobilization with alginate as a carrier.

EXPERIMENTAL: Brilliant green dye, yeast and hydrogel beads were prepared as described by Krunic *et al*. [2]. 3 types of biosorbent are made using extrusion technique: beads containing 6.0 % of yeast and 1.6, 1.2 and 1.0 % of alginate. Experiments were conducted in 3 Erlenmeyer flasks (500 mL) containing 200 mL of the dye (25 mg/L) and 40 or 60 g/L wet adsorbents. The concentration of the dye was analyzed using a spectrophotometer (UV/Vis spectrophotometer, Ultrospec 3300 pro, Amerischam Bioscienc) at 624 nm. The Fourier transform infrared (FTIR) allowed the identification interactions between dye and biosorbents. All the measurements were done using a Nicolet iS10 spectrometer (Thermo Scientific, Sweden).

RESULTS AND DISCUSSION: It was determined by light microscopy that the reduction of the amount of alginate in the biosorbent did not significantly affect the dimensions and sphericity of the particles. They were spherical beads with a diameter of about 3.3 mm. The biosorbent containing 1.2 % alginate showed the highest adsorption capacity, slightly lower capacity shows the biosorbent with 1 % alginate, while the biosorbent with the highest amount of alginate showed the lowest dye binding capacity. The addition of 40 g/L of wet biosorbent proved to be a more efficient way of purifying wastewater compared to the addition of 60 g/l hydrogel beads.

CONCLUSIONS: By combining alginate and yeast, it is possible to make an effective biosorbent that absorbs over 90 % of the dye from the aqueous solution for a short time. The biosorbent containing 1.2 % alginate and 6.0 % yeast showed the highest adsorption capacity. From the obtained results, it can be concluded that yeast has a greater capacity for dye binding than alginate and that increasing the concentration of alginate above 1.2 % does not contribute to increasing the capacity for binding dye to the biosorbent, while lower alginate concentration values of 1.2 % slightly decrease the capacity of the biosorbent.

Acknowledgements: This work was supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia (Contract No. 451-03-47/2023-01/200287).

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