

Title: EVALUATION OF SODIUM ALGINATE CONCENTRATION IN CELL IMMOBILIZATION OF *Saccharomyces cerevisiae* WITH MAGNETIC NANOPARTICLES

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Abstract:

Cell immobilization has been proposed as improvement methodology for the yeast resistance during fermentation and for the productivity increase. The sodium alginate is commonly used in cell immobilization. That is because it is soluble in water and become insoluble in the presence of divalent cations. Magnetite (Fe_3O_4) is a black ferromagnetic mineral, which contains Fe^{II} and Fe^{III} . This work aims to study the alginate concentration influence in the *Saccharomyces cerevisiae* immobilization with magnetite nanoparticles. The defined conditions for the immobilization were: 10 ml of distilled water, 1.0 g of cell and 0.1 g of magnetite. And the sodium alginate concentrations studied were 1%, 1.5% and 2%. The support was prepared by mixing the magnetic particles and the sodium alginate in water. This mixture was subjected to ultrasonic treatment with agitation for 30 minutes. In parallel, it was prepared 100 ml of calcium chloride solution 0.1M. The *Saccharomyces cerevisiae* was added to the sodium alginate and magnetite mixture. Then, this mixture was added into a burette and dropped in calcium chloride solution. The formed spheres remained immersed for 2 hours in the solution at a temperature of 4°C and then they were washed with distilled water. For this support amount, it was prepared 100 ml of medium composed by (g/l): glucose (100.0), yeast extract (1.0), $(\text{NH}_4)_2\text{SO}_4$ (10.3), KH_2PO_4 (0.5) and $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ (0.5). The medium was previously sterilized. The fermentation was maintained at 30°C for 24 hours and agitation of 100 rpm. All the experiments were performed in duplicate and tested, if possible, more than one 24 hours sequential reuse cycle, verifying, between each cycle, the beads resistance visually. The cycles reuse increase was maintained while the visual results show themselves feasible. The variation in the sodium alginate concentration in this study showed no influence in the fermentation kinetics. The cell immobilization performed with 1% alginate was not resistant to be used in more than one 24 hours cycle. The tests performed with 1.5% and 2% alginate reached 3 and 4 cycles, respectively, until they present no more resistance for reuse. This results exclude the alternative of using 1% of sodium alginate in the cell immobilization, and enables the study of values between 1.5% and 2%, in order to maintain the immobilization resistance and reduce process costs.

Keywords: alcoholic fermentation, cell immobilization, magnetite, *Saccharomyces cerevisiae*, sodium alginate.