

SUMMIT

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Book of Abstracts

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Supported ionic liquids for L-asparaginase downstream processing

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Abstract. L-asparaginase is an enzyme applied as a biopharmaceutical, as an acrylamide reduction agent and in the development of biosensors for the detection of L-asparagine (Nunes et al., 2020). L-asparaginase is widely distributed in nature, but microorganisms are the preferential source of production since they easily grow on inexpensive substrates (Lopes et al., 2017). For all the described applications, high levels of enzyme purity are required, reinforcing the need of developing cost-effective processes for the L-asparaginase purification.

The major focus of this work is to develop an alternative and simple semi-continuous flow-through downstream process using Silica-based supported ionic liquid-like phase (SSILLP) materials for the purification of L-asparaginase. SSILLP materials comprise ionic liquids (ILs) covalently attached to silica, allowing distinct interactions to be established between the target compounds and the support.

SSILLP materials based on quaternary ammonium cations with different alkyl chain lengths and the Cl anion were synthesized and characterized by elemental analysis, point of zero charge, Attenuated total reflectance-Fourier-transform infrared spectroscopy, Brunauer-Emmett-Teller surface area analysis, Barrett-Joyner-Halenda pore analysis, and scanning electron microscopy (SEM). An initial screening was performed to select the most promising SSILLP material for L-asparaginase purification. Optimization of L-asparaginase purification conditions, namely pH and solid/liquid ratio, was then carried out by Response Surface Methodology. Semi-continuous L-asparaginase purification was finally addressed using the best identified SSILLP material under optimized conditions (pH 3 and solid/liquid ratio of 15), attaining a purification factor of 5.15. Through this method, process costs could be significantly reduced, leading to the decrease of the enzyme price and thereby enabling its widespread application.

Keywords: *L-asparaginase, Downstream processing, Supported ionic liquids.*

References.

Lopes, A.M., Oliveira-Nascimento, L. de, Ribeiro, A., Tairum Jr, C.A., Breyer, C.A., Oliveira, M.A. de, Monteiro, G., Souza-Motta, C.M. de, Magalhães, P. de O., Avendaño, J.G.F., Cavaco-Paulo, A.M., Mazzola, P.G., Rangel-Yagui, C. de O., Sette, L.D., Converti, A., Pessoa, A., 2017. Therapeutic l-asparaginase: upstream, downstream and beyond. *Crit. Rev. Biotechnol.* 37, 82–99. <https://doi.org/10.3109/07388551.2015.1120705>

Nunes, J.C.F., Cristóvão, R.O., Freire, M.G., Santos-Ebinuma, V.C., Faria, J.L., Silva, C.G., Tavares, A.P.M., 2020. Recent strategies and applications for L-asparaginase confinement. *Molecules* 25, 5827. <https://doi.org/10.3390/molecules25245827>

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