Carbon nanomaterials for the purification of antileukemic drugs

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Getting older is the biggest risk factor for most fatal diseases, including cancer, heart disease and Alzheimer. To overcome such age-related society diseases, it is crucial to optimize the production and purification of biopharmaceuticals, such as nucleic acid-based products, antibodies and recombinant proteins and enzymes. Low cost production combined with high purity levels allow their routinely use by a widespread population. Continuous progresses have been made for the development of recombinant therapeutic enzymes. L-asparaginase (LA) is an antileukemic biopharmaceutical enzyme of current high-cost. LA is produced via fermentation and its purification usually comprises several steps that account up to 80% of its total production cost (1).

This work aims to develop sustainable technologies to extract and purify LA. Reusable functionalized nanomaterials, namely carbon nanomaterials (CNTs), are used as cost-effective purification techniques for the target enzyme. Initially, the synthesis and modification of CNTs was performed. Different CNTs were obtained and used for the purification of LA. Commercial LA was used for the first purification tests, in order to understand the behaviour of the enzyme in contact with the nanomaterial. Experimental conditions, such as pH, and material/LA ratio, contact time were optimized. LA activity was quantified by Nessler reaction (2). The first results reveal a total adsorption of LA by the CNTs. Depending on the CNT functionalization/ treatment, different values of recovered activity of LA were obtained.

The modified CNTs are shown to be very promising nanomaterials for the purification of LA. The LA was easily attached to CNTs by adsorption under mild conditions. CNTs supports can be a real alternative for a single step immobilization/purification of LA.

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