J Chromatogr Sep Tech 2016, 7:6(Suppl)
http://dx.doi.org/10.4172/2157-7064.C1.020

^{90}Sr-^{90}Y generator system based on membrane-assisted liquid phase extraction

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Long-lived radionuclide ^{90}Sr is an ideal source of carrier-free ^{90}Y ($T_{1/2}$=64.1 h, $E_{\beta max}$=2.3 MeV), which has suitable radionuclidic characteristics for the application in endoradiotherapy of malignant tumors. Separation of Y(III) from Sr(II) with 15% (v/v) di(2-ethylhexyl)phosphoric acid (DEHPA) in dodecane was performed using the hollow fiber supported liquid membrane (SLM) contactor operated in a recirculation mode. The influence of various experimental parameters (contact time, donor pH, DEHPA concentration, donor and acceptor flow rates) on the mass transfer rate of Y(III) and the separation effects in the applied system was investigated. The steady-state was established after about 5-6 hours of operation. A yield of Y(III) in the acceptor phase increased as the flow rate of both aqueous phases increased and reached 72% at the acceptor flow rate of 1.9 cm^3min^{-1} and the donor flow rate of 4.7 cm^3min^{-1}. However, a breakthrough of Sr(II) through the SLM also increased with increasing the acceptor flow rate, so that flow conditions must be optimized to find a balance between the requirement for a high yield of Y(III) in the acceptor phase and a low breakthrough of Sr(II) through SLM. Hollow fiber SLM contactor operated in a recirculation mode under optimized flow conditions could be used for the development of ^{90}Sr-^{90}Y generator system and milking of ^{90}Y in the form suitable for direct complexation with various chelating agents and preparation of ^{90}Y-radiopharmaceuticals.

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Ionic liquid-based materials for advanced CO_2 separation membranes

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The adoption of 2016 Paris protocol on climate change makes the reduction of greenhouse gas emissions from industrial sources, through carbon dioxide (CO_2) capture and re-use/storage is crucial. Considering that the energy input for materials regeneration and the capital cost of specific equipment are the most significantly contributors to the overall cost of the currently used CO_2 capture process (gas absorption using amines), new cost-effective and high performance technologies urge to be researched, where the design of materials with the ability to efficiently separate CO_2 from N_2 is of vital importance. Considering the extremely broad range of chemical and structural possibilities of ionic liquid (IL) chemistry and the undeniable engineering and economical advantages of membrane technology, there has been growing interest in the exploitation of IL-based materials for CO_2 separation membranes. The use of the structure-property relationship of ILs enables the molecular control of their remarkable CO_2 affinity, while the use of IL-based supramolecular networks, like poly(ionic liquid)s (PILs), allows the introduction of structural material features relevant for gas separation. In this communication, a perspective on different strategies that use IL-based materials as a unique tunable platform to design task-specific advanced materials for CO_2 separation membranes will be presented. The aim is not only to show the versatility of these materials in the development of innovative CO_2 selective membranes but also point up their easy preparation. Based on the data obtained, the CO_2 separation efficiency of different membranes will be discussed, as well as breakthroughs and key challenges in this field.

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