MEMBRANE ABSORBERS PURIFICATION OF CU-67 FOR THERANOSTIC USE

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Radiopharmaceuticals offer promising new approaches for imaging and treatment for cancer patients; however, the current supply of these novel drugs is too low to support clinical trials. Cu-67 is a theranostic isotope, which emits a gamma rays, for imaging, and beta particles, for treatment. Current production methods of Cu-67 involve irradiating a ZnO foil, initiating radioactive decay, and producing the desired Cu-67 and other undesired products. The foil is dissolved in HCl and purified in a resin-based column to extract Cu-67. Resin-packed columns have diffusion limitations which can lead to long purification times and low yields. Due to the short half-life (2.58 days) of Cu-67, rapid purification is key for increasing the availability of the isotope for clinic trials and use.

Membrane absorbers have been shown to provide rapid and high yield separations in other fields; making it a promising new candidate to extract Cu-67. In this research we will demonstrate how to functionalize polyvinylidene fluoride (PVDF) membrane absorbers by grafting glycidyl methacrylate (GMA) brushes through activator generated by electron transfer atom transfer radical polymerization (AGET ATRP). GMA brushes are further reacted to incorporate amine-based ligands. We hypothesize that grafting polymeric ligands from the membrane surface will increase Cu capacity and yield. Fourier-Transform Infrared Spectroscopy is used to support functionalization and calculate the degree of grafting of GMA on the ultrafiltration membrane. Membrane binding capacities were estimated by modeling equilibrium batch adsorption data with the Langmuir adsorption isotherm. Cu concentrations were measured by inductively coupled plasma mass spectrometry. The results of this research lay the groundwork for the implementation of membrane absorbers in isotope separation and may alleviate the bottle-neck associated with Cu-67 production.