ON THE DEVELOPMENT AND CHARACTERISATION OF AN HYDROXAMATE BASED EXTRACTION CHROMATOGRAPHIC RESIN

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Zr separation chemistry is of increasing interest in various domains. Long-lived Zr-93 ($t_{1/2}$ = 1.61(6) a, $E_{\square,max}$ = 90.3(15) keV [1]) frequently needs to be determined in decommission and radioactive waste samples. It is often quantified by mass spectrometry, accordingly isobaric interferences and matrix elements need to be removed very thoroughly before measurement. Zr-89 on the other hand is gaining more and more interest in immuno-PET due to its favorable physical properties ($t_{1/2}$ = 78.42(13), 100% EC/ □E □ = 908.97(3) v cyclotron produced via a (p,n) reaction from natural Y (Y-89) targets.

Hydroxamate based resins as e.g. described by Holland [2] are often used to separate Zr from the Y target material. The synthesis of the described resin involves the use of irritating (GHS07) and hygroscopic reagents such as 2,3,5,6-tetrafluorophenol. In order to overcome this drawback it was tried to develop a stable and ready to use hydroxamate based extraction chromatographic resin.

A number of prototypes based on different hydroxamates and diluents were manufactured and characterized with respect to D_W values of selected elements in varying HCl and HNO_3 concentrations. Based on the obtained data, elution studies were performed on five of these prototypes in order to identify the best suitable prototype. Results of these studies will be presented.

In order to also allow the separation of Zr from large Y targets (up to several g) a two-step procedure using hydroxamate resin for the final Zr purification was developed.

[1] LNHB recommended data, http://www.nucleide.org/DDEP_WG/DDEPdata.htm, accessed 29/07/15

[2] Jason P. Holland, D.Phil, Yiauchung Sheh, Jason S. Lewis, Ph.D: “Standardized methods for the production of high specific-activity zirconium-89”, Nucl Med Biol., 36(7), 2009, 729–739; doi:10.1016/j.nucmedbio.2009.05.007