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Separation of carrier free 177Lu from 177Lu /Yb mixture by electro-amalgamation of ytterbium

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The process of isolation of no-carrier added 177Lu produced via 176Yb(n,gamma)177Yb - 177Lu from mixture containing macroscopic amounts of the ytterbium target material was investigated. For this purpose a novel method of electrochemical selective amalgamation of ytterbium from 177Lu/Yb mixture into mercury-pool cathode was applied. The electrolyte solution contained mixture of 20 mg ytterbium in 5M HCl and 177Lu as 177LuCl3 in 0.15 M sodium citrate. As anode platinum plate was used. In order to develop an optimal condition of amalgamation of ytterbium, effects of pH of the electrolyte solution, potential and time of the electrochemical process as well as number of cycle of electrolysis performed under the same conditions using fresh electrodes were examined. The concentration of lutetium and ytterbium in the electrolyte solution was determined by spectrometry ICP-OES. The best performance of the method, allowing cementation up to 94 % of ytterbium from the 177Lu/Yb mixture was obtained at pH of 6-7, potential of 8 V, time of 60 min and two cycles of the electrolysis. Concentration of 177Lu in the solution after fixing ytterbium in amalgam remained at the same level. As results of such defines process molar ratio of Yb:Lu was reduced from 3000 to 170. The atomic absorption spectroscopy (AAS) measurement showed that the content of mercury in the solution containing 177Lu after cementation of the ytterbium was bellow detection and determination limit level amounted respectively 0.3 and 0.6 µg/kg.

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