SEPARATION OF GALLIUM FROM ZINC USING ION EXCHANGE AND ADSORPTION RESINS. PREPARATION OF Ga-67 FOR USE IN NUCLEAR MEDICINE. Santos, E.E., Mestnik, S.A.C. Instituto de Pesquisas Energéticas e Nucleares. São Paulo, Brasil.

Ga-67 is a ciclotron-produced carrier-free radioisotope. Due to its good nuclear characteristics: a relative short half-life (78 h) and emission of moderate energy gamma rays (93 KeV, 184 KeV, 296 KeV and 388 KeV), this radionuclide is considered to be suitable for nuclear medicine applications, specially to detect tumour and inflammatory lesions in soft tissues.

In this work we present a comparative study among the ion exchangers, AG50W-X4(100-200 mesh), AG50W-X8(200-400 mesh) and the adsorbent SM-7 (20-50 mesh) for Ga-67/Zn separation.

Firstly, the chemical stability of SM-7 adsorbent as a consequence of different gamma radiation doses was verified and also the distribution coefficient of Ga-67 on this adsorbent was determined.

Secondly, chromatography column parameters such as internal diameter and resin bed volume were studied using all resins. Afterwards, the volume of washing solution and the concentration and volume of the eluent solution were optimized using SM-7 adsorbent.

At last the quality control of Ga-67-citrate solution was carried out in order to guarantee it could be used for nuclear medicine purposes.

The obtained results show that SM-7 adsorbent is stable up to a radiation dose of 4.8 Gy and also that it is highly capable of adsorbing Ga-67 { $Kd = (2.4 \times 10^3) \pm (0.2 \times 10^3)$}.

From the comparative study carried out with the different resins we conclude that SM-7 adsorbent is the best for Ga-67/Zn separation, for it requires only a small amount of resin ($0.28 cm^3$), a small volume of washing solution (15 ml 7M HCl) and also a small volume of eluent solution (7.0 ml 0.01M HCl) to achieve a Ga-67 separation yield of (92.9 ± 2.5)%. Additionally, the use of chemical reagents in lower concentrations than those used for other ion exchangers makes SM-7 adsorbent the best choice for Ga-67 production. In this way we expect that under such conditions we can reduce costs and time with maintenance of the hot-cell apparatus.

The quality control performed with the Ga-67-citrate solution shows that it is chemical (0.1μg Fe/ml and 0.2 μg Zn/ml) and radiochemically pure (around 99% as Ga-67-. citrate). Owing to these related properties, Ga-67 is highly recommended for use in nuclear medicine, being only necessary the sterilitic and pyrogenic tests.

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