Contribution ID: **147** Type: **Poster**

Development of production possibilities of n.c.a radiomanganese in a non aggressive and toxic medium

Wednesday, 19 September 2012 18:00 (1h 50m)

In view of new arising hybrid imaging methods, e.g. the PET/MRT combination [1], it is of high interest to develop new multimodal imaging tracers. In these imaging tracers rests the potential for the evaluation of old and new contrast agents in MRT, especially concerning new nanoparticle contrast agents. A large part of these newly composed MRT contrast agents are manganese based [2]. Therefore the cross sections for Cr-nat(p,xn)Mn-52g,m reactions and its byproducts (V-48,Cr-48,49,51) were measured up to 45 MeV, and a method was developed to separate n.c.a. radiomaganese from bulk chromium by ion chromatography.

Cross section measurements were conducted by the stacked-foil technique. Because of the brittle nature of metallic chromium an electrodeposition method [3] was used to obtain thin metallic layers on a gold backing. Multiple foil stacks were irradiated with protons of 17 or 45 MeV incident energy. The measured cross sections differ only slightly (1-10%) from literature, except for the Cr-nat(p,xn)Cr-51 reaction which shows a massive divergence (≈400%) from published data [4]. This ascertained our previous measurements [5].

For the development of the separation process cast plates of chromium were irradiated with protons in the energy range of 17 to 7 MeV. These targets were dissolved in fuming HCl. Bulk chromium was then separated from n.c.a. Mn-52 by means of ion chromatography with the cationic exchange resin DOWEX 50WX8. A quantitative separation was achieved with 0.1 M sulfuric acid as eluent for chromium and a 0.067 M ammonia citrate solution with pH 7.3-7.4 for n.c.a. radiomanganese. The latter eluent is not aggressive and not toxic. The separation took 3-4 h and 99% of Mn-52 was eluted from the column in ca. 12 ml of the eluent.

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Session Classification: Poster Session

Track Classification: Nuclear Chemistry, Radionuclide Production, High-Power Targetry