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Flexible irradiation facility for the production of radionuclides

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Reactor production of radionuclides is well established. However, more and more new, unconventional production routes are being requested as consequence of new applications in nuclear medicine. In order to be able to fulfil new irradiation requests it is important to design flexible irradiation facilities. Here, we present new irradiation facility with built in flexibility allowing tuning the radiation field according to the desired application. The flexibility is built in using three shielding blocks that can be composed of different materials and can be exchanged if necessary. We will illustrate the idea of this facility using lead as a shielding block, which has been used to reduce gamma flux while keeping the neutron flux unchanged. The lead variant of the facility has been used to increase the specific activity of Ho-166 polymeric microspheres used in liver cancer treatment. These microspheres can currently be irradiated for a limited time since they get damaged by the present in the reactor pool gamma photons, limiting the amount of radioactivity produced. Utilizing the new facility we show at least 4-fold increase of the ^{166}Ho specific activity without damaging the polymeric material.

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