

Effects of the Tantalum and Silver Targets on the Yield of FDG Production in the Explora and CPCU Chemistry Modules

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Ionic contaminants in water have generally been considered to influence the reactivity of n.c.a. [^{18}F]fluoride decreasing the yield in the synthesis of radiopharmaceuticals by nucleophilic fluorination. Until a few years ago the most widely used material for target chamber in ^{18}F -production was silver. However, more recently, the use of refractory materials such as tantalum and niobium has been shown to provide highly reactive fluoride.

The PET Center at the National Autonomous University of Mexico (UNAM) produces [^{18}F]fluoride ion for FDG synthesis in two different targets: a high volume (2.4 mL) gridded tantalum-target and a low volume (1.2 mL) double-foil silver-target capable to withstand 660 and 440W of beam power at 11 MeV, respectively. Chemistry modules for FDG production at this facility include an Explora recently acquired to replace a CPCU in use since 2001. The Explora module is used primarily for the routine production of FDG while the CPCU serves as a backup for the Explora and for the production of other non-FDG tracers. Figure below shows the yields of FDG in six-consecutive months using a tantalum and a silver target for fluoride production. The FDG yields when using the silver target range from 60 to 70% compared to 70 to 80% when using the tantalum target, clearly showing the superiority of tantalum vs. silver to produce highly reactive fluoride.

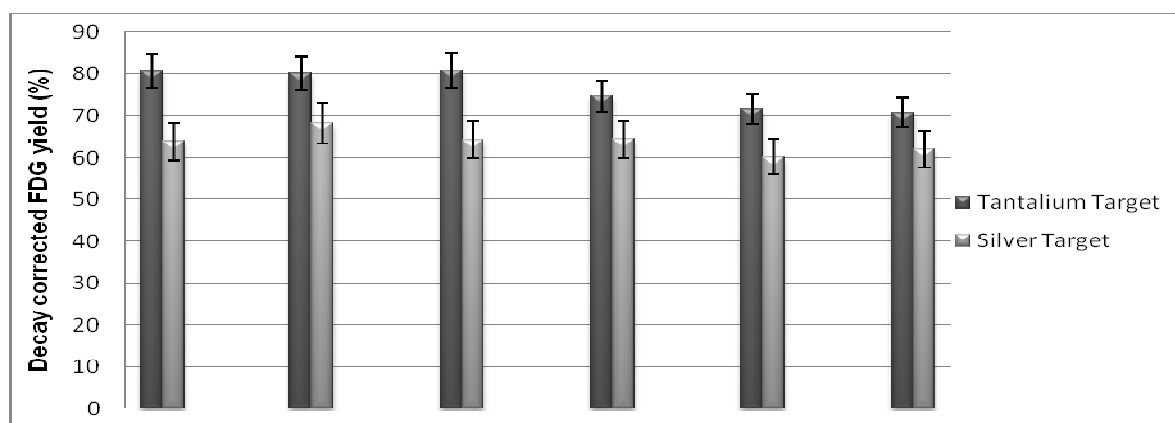


Figure 1. Six-month FDG yields in the Explora module using ^{18}F from two different targets.

Regarding the use of the Explora and CPCU modules, we found no significant difference in their FDG yields, independently of the target used for fluoride production, and their synthesis time is practically the same (~45 min). However, the Explora features a single closed reaction vessel with heating/cooling by forced convection including temperature, pressure and radiation sensing. Performs up to four sequential runs of FDG without intervention. On the other hand, the CPCU features two open reaction vessels heated by two independent oil baths that can be used for back-to-back synthesis, but it lacks of any kind of sensors to monitor the performance of the synthesis.