

Development of ^{18}F radiochemistry for tracer particle production at PEPT (Cape Town)

Positron Emission Particle Tracking (PEPT) is a radioactive tracer technique used to track the trajectory of a radioactively labelled macroscopic particle using a variant of Positron Emission Tomography (PET). The primary application of PEPT is to study dynamic flow systems under varying conditions; including a wide range of particle size distributions, physical, and chemical properties (e.g. densities, shapes, surface chemistry, friction coefficients, etc.), with applications across the science disciplines. We are interested in developing ^{18}F based tracer particles using both radiochemical and physical methods for PEPT applications.

For radiochemical tracer particle production, we are interested in extracting ^{18}F from commercially available 18-fluorodeoxyglucose (^{18}F FDG) as well as exploring synthesis methods with ion-exchange techniques to label small phase-representative resin particles (diameter < 1 mm). For physical activation we will primarily be looking at the reaction $^{16}\text{O}(\alpha, \text{pn})^{18}\text{F}$ to produce positron emitters in-situ for larger particles (> 5 mm diameter).

This work will develop iThemba LABS specific tracer particle production mechanisms using ^{18}F for the first time, and will provide insight into the effects of tracer particle properties in PEPT applications including optimisation of the PEPT technique and enhanced tracer production mechanisms.

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Session Classification: Posters