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Development of 18F 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 18F based tracer particles using both radiochemical and physical methods for PEPT applications.

For radiochemical tracer particle production, we are interested in extracting 18F from commercially available 18-fluorodeoxyglucose (18FDG) 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 16O(alpha,pn)18F to produce positron emitters in-situ for larger particles (> 5 mm diameter).

This work will develop iThemba LABS specific tracer particle production mechanisms using 18F 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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