Quality control of [^{18}O]target water for FDG production using PIXE analysis

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Abstract

The content of impurities in enriched [^{18}O]water such as organic substances (ethanol, acetonitrile, etc) and inorganic ions (k, Na, Cl, etc) is an important quality control aspect to assure reliable [^{18}F]fluoride formation followed by high quality FDG production for clinical purpose. Since the target water is highly expensive, PET centers are forced to reuse after FDG synthesis. However, its recovered water contains various impurities. In this paper, a simple and highly sensitive method for the detection of various elements in the enriched [^{18}0]H_2O was developed by PIXE analysis method. Furthermore, the recovered water was explored the possibility of its purification using a variety of Sep-Pak cartridges such as ion-exchange sorbent. Level of elemental impurities including K and Cl were higher in recovered water than in the newly purchased [^{18}O]water (virgin water). A trace titanium derive from a target chamber was also detected in recovered water. However, the reproducibility of this method seemed to be insufficient for a technical heterogeneity of PXIE target preparation.