



Contribution ID: 138

Type: Poster

## Electrosynthesis of electrophilic n.c.a. $^{18}\text{F}$ -fluorinating reagents

Monday, 17 September 2012 17:30 (1h 30m)

Because of its extraordinary suitable decay properties fluorine-18 is the most widely used radionuclide in positron emission tomography (PET) [1]. Presently the radioorganic syntheses of no-carrier-added (n.c.a.)  $^{18}\text{F}$ -labelled products are practically limited to nucleophilic procedures. This complicates or excludes n.c.a. syntheses of many putative tracer compounds and intensifies a special demand for electrophilic  $^{18}\text{F}$ -labelling. There is the unanswered question whether an electrochemical oxidation of nucleophilic  $^{18}\text{F}$ fluoride can lead to an electrophilic  $^{18}\text{F}$ fluorine analogue. Since in organic fluorochemistry N-F compounds are known as highly effective and selective electrophilic fluorinating agents [2], they were chosen to be synthesized with n.c.a.  $^{18}\text{F}$ fluoride.

Based on cyclic voltammetric measurements an electrochemical synthesis of  $^{18}\text{F}$ N-fluorobis(phenylsulfonyl)amine was attempted. Bis(trifluoromethylsulfonyl)imide with 1-butyl-1-methylpyrrolidinium as counter anion was chosen as a putative suitable precursor. Due to its excellent physical and electrochemical properties this ionic liquid serves as conducting salt, solvent and starting material at once and offers a simplified performance by avoiding major side reactions. Cyclic voltammetry of bis(trifluoromethylsulfonyl)imide showed two succeeding oxidation steps. The first step may lead to a resonance-stabilized radical before further oxidation causes the generation of an unstable cation and finally the decomposition of the compound.

Further electrosynthetic experiments were carried out in an established electrochemical cell [3]. After intercalating  $^{18}\text{F}$ fluoride from aqueous solution into glassy carbon (Sigradur®G) the ionic liquid was added. At a tension of 6-8 V intercalated fluoride and bis(trifluoromethylsulfonyl)imide were expected to co-oxidize and recombine at the surface of the electrode. Products were separated from their ionic contents and analyzed by radio-HPLC. An unambiguous identification could not be achieved due to the lack of a reference compound. A resulting n.c.a. organic product, however, showed a similar HPLC-retention with co-injected bis(phenylsulfonyl)imide as "pseudostandard". Thus, in principle a production of an n.c.a. electrophilic  $^{18}\text{F}$ -fluorinating reagent starting from  $^{18}\text{F}$ fluoride appears probable.

### References:

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**Session Classification:** Poster Session

**Track Classification:** Radiopharmaceutical chemistry, radiodiagnostics, radiotherapy, theragnostics