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Development and validation of a headspace gas chromatographic method for the determination of residual solvents in [¹⁸F]FDG

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Introduction

- The quality control of [^{18}F]FDG produced at University Institute of Positron Emission Tomography is in accordance with quality requirements of EP monograph 01/2014:1325.
- Residual solvents is one of the post-release parameters applied on every produced batch.
- Considering the synthesis of [^{18}F]FDG injection, ethanol and acetonitrile occur as residual solvents.

Headspace gas chromatographic method

- Developed and validated for the determination of ethanol and acetonitrile.
- Shimadzu gas chromatographic system GC-2010 plus - equipped with FID and head space injector HS-20.
- DB-624 column (30 m x 0,53 mm, 3 μm) with split injection, temperature gradient elution with helium as carrier gas.
- Method validation was done by evaluating parameters as specificity/selectivity, linearity and range, detection limit, quantitation limit, precision and accuracy.

EP general chapter 5.4



Ethanol
Class 3
Limit 5000 ppm

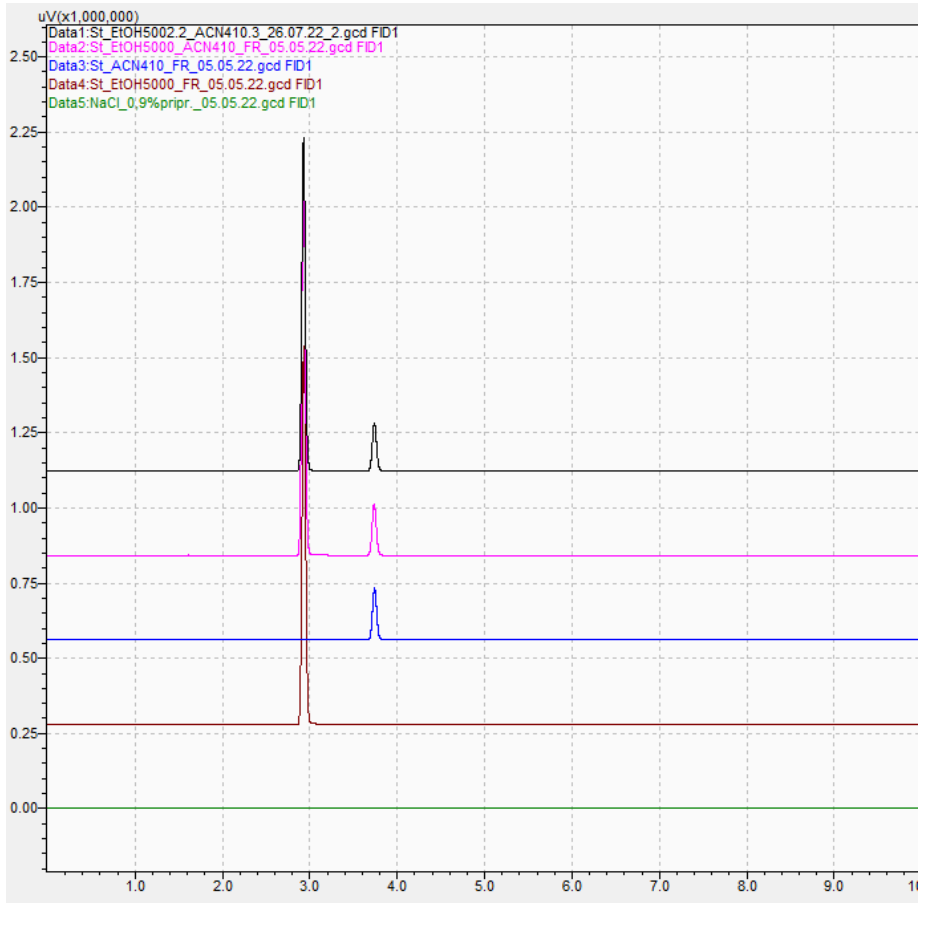


Acetonitrile
Class 2
Limit 410 ppm



Results

Specificity/Selectivity



Linearity and range (from LOQ to 120 % of the limit level concentration)

Residual solvent	Linear Range ($\mu\text{g/mL}$)	Calibration equation	Correlation coefficient (R^2)
Ethanol	25 - 6000	$y = 647,29x + 2292,8$	0,9999
Acetonitrile	2 - 492	$y = 1332,1x - 3182$	0,9999

Lower Range Limits

DL and QL based on the residual standard deviation and the slope

Residual solvent	Detection limit (DL) ($\mu\text{g/mL}$)	Quantitation limit (QL) ($\mu\text{g/mL}$)
Ethanol	8,2	25
Acetonitrile	0,6	2

Method precision - Repeatability & Intermediate precision

Residual solvent	6 determinations at 100 % of the test concentration	Day 1	Day 2
		Analyst 1	Analyst 2
Ethanol	RSD area < 15 %	0.99	1.51
	F-test value < 5.05		0.42
Acetonitrile	RSD area < 15 %	1.16	1.46
	F-test value < 5.05		0.61

Accuracy & Precision

Residual solvent	3 determinations each conc. ($\mu\text{g/mL}$)	Recovery %	RSD < 15 %
		80 % - 120 % for QL 85 % - 115 % 100 % and 120% test conc. (average)	
Ethanol	25	88.61	0.64
	5000	99.32	1.64
	6000	99.19	0.97
Acetonitrile	2	94.05	4.35
	410	98.50	1.02
	492	99.68	1.40

Conclusion

This method was successfully applied for the quantitative determination of ethanol and acetonitrile in [18F]FDG injection as a simple and reliable solution for routine analyses.



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**THANK YOU FOR YOUR
ATTENTION!**

