

# Development of a sensitive CE-LIF method for the analysis of synthetic cathinones

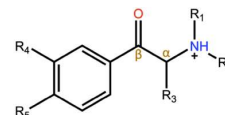
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## INTRODUCTION

Synthetic cathinones (SCs) are phenylalkylamine compounds related to natural cathinone from *Catha Edulis* leaves. Given their structural similarities with amphetamines, these compounds are mainly drugs of abuse. Indeed these substances constitute the second most frequently seized group of new psychoactive substances (NPS) and counted more than 130 compounds in Europe (EMCDDA 2016). In this context, reliable analytical tools are required to track these substances.



In the present project, we developed a capillary electrophoresis separation method coupled to laser induced fluorescence detection (CE-LIF) to analyze most frequently observed SCs. Due to their lack of native fluorescence, analytes were labeled using fluorescein isothiocyanate isomer I (FITC). The labeled-compounds present **closely related structures, some of them being isobaric** (identical mass and charge). To tackle this analytical challenge in terms of separation, various additives in the background electrolyte were investigated.

## MATERIAL AND METHOD

### Targeted SCs

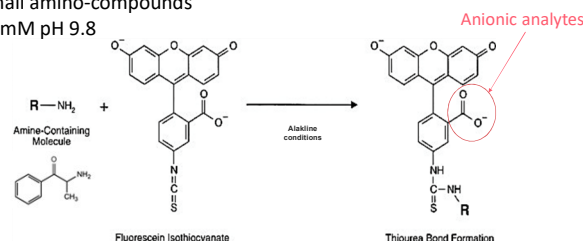
Amphetamine	4-ethylmethcathinone	MDMA
Methamphetamine	Cathinone	Methylone
Norephedrine	Methcathinone	Pentylone
Mephedrone	Methedrone	4-methylmethcathinone
Pentadrone	3-methylmethcathinone	3,4-Methylenedioxcathinone

### Labeling protocol

Previously developed on small amino-compounds

Reaction buffer : Borate 20 mM pH 9.8

FITC dissolved in DMSO



### CE-LIF

Agilent 7100 Capillary Electrophoresis

Picometrics ZETA LIF detector using a 488 nm laser (20 mW)

Silica capillary 50  $\mu$ m id, 65 cm effective length (Ltot = 85.5 cm)

Injection : 50 mbar during 8s ; Voltage : 25 kV

## SEPARATION OPTIMIZATION

- Well described in literature
- Typically used with labeled compounds
- Generate reproducible EOF
- No impact of pH on charge

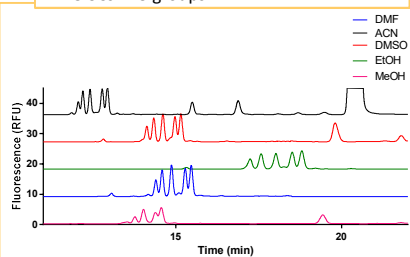
Borate buffer  
pH 9.3

Investigate  
other additives

Further investigations:

- Additives required to separate isobaric compounds
  - Cyclodextrines
  - Mix with ionic surfactants
  - Low % of solvents

- Investigation of **organic solvents** (5-10%)
- 15 SCs in 3 groups



- Co-migration in each group
- Significant peak broadening

Solvents

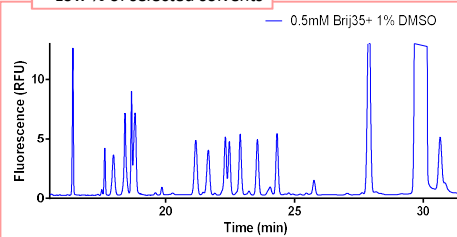
CE method  
development

Low [Brij 35]  
Solvents

MEKC

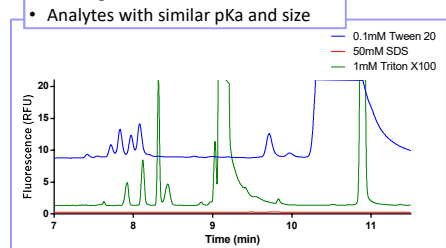
Brij 35

- Low % of selected solvents



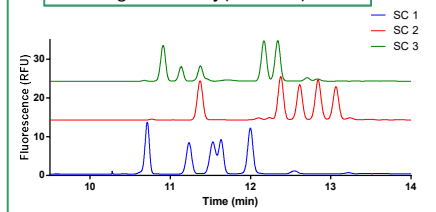
- 13 peaks detected
- Isobaric compounds separation still challenging

- Investigation of **surfactants**
- Analytes with similar pKa and size



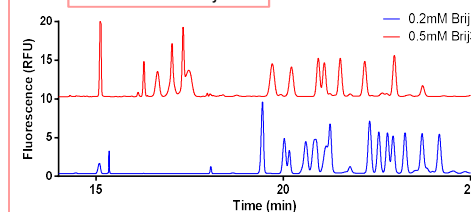
- Encouraging separation with non ionic surfactant

- Investigation of Brij (1-30 mM)



- 5 peaks in each group obtained
- Significant improvement at low Brij concentration
- Isobaric compounds separation still challenging

- Mix of 15 SCs
- 0.1 to 1 mM Brij 35



- Addition of solvent without success (peak broadening and long time of analysis)

## CONCLUSIONS AND PERSPECTIVES

- Significant separation improvement using non ionic surfactant Brij 35 at low concentration
- Poor improvements obtained by adding solvents

Future work:

Investigate other additives such as cyclodextrines and ionic surfactants

Optimize the labeling protocol in terms of sensitivity and repeatability for SCs using design of experiment (DoE) strategy

Improve the MEKC-LIF method to reach a large migration window for SCs and derivatives analysis