



Villeneuve-d'Ascq, le 15 novembre 2019

**Luc-Sy TRAN**

Chargé de Recherche CNRS

PC2A

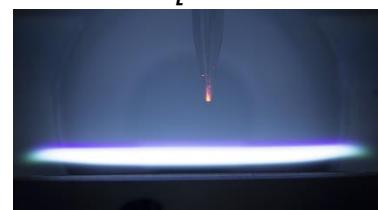
CNRS-Univ. Lille

# Aide de l'IRePSE

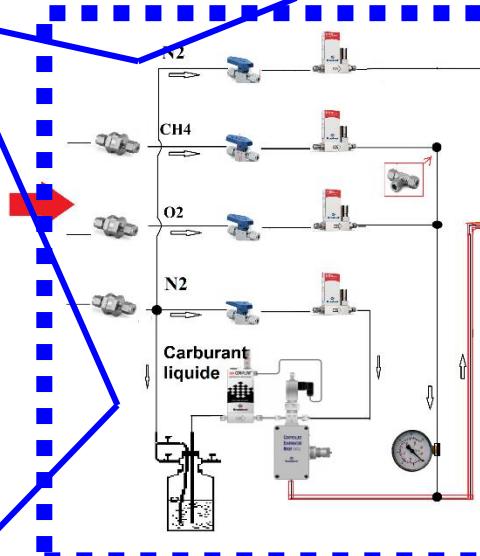
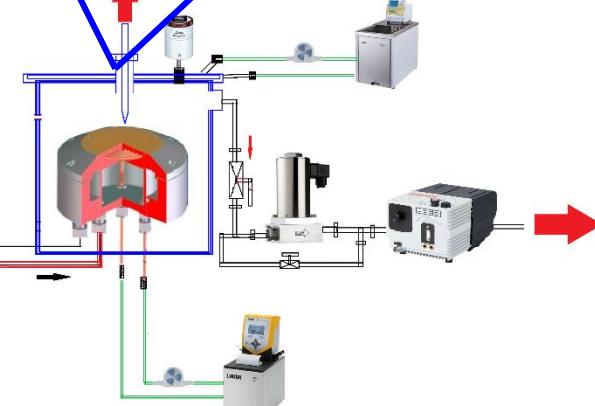
Reçu 4000 euros via AAP 2018 -installation personnel recruté récemment-



[source: PC2A]



Système de prélèvement  
Analyse par GC-TCD-méthaniseur/FID-MS



Système d'allimentation en  
carburant au brûleur

# Application du système installé

## Etude des réactions de carburants et de formation de polluantes lors de la combustion



~ 94%  
Carburants fossiles



### Biocarburants

- Source d'énergie renouvelable
- Diminution de la dépendance au pétrole
- Sécurité énergétique

fournir  
> 80% énergie primaire



Réduction des polluants

- Mécanisme réactionnel des combustibles ?
- Formation des polluants ? (Aldéhydes, NOx, Suies.....)

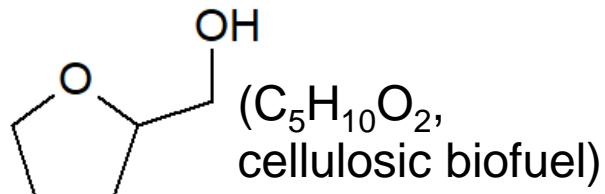


# Application du système installé

## « Study of the high-temperature combustion chemistry of tetrahydrofurfuryl alcohol (THFA) »

L-S Tran, H-H Carstensen, KK Foo,  
N Lamoureux, S Gosselin, L Gasnot,  
A El-Bakali, P Desgroux.

(Submitted to 38<sup>th</sup> Combustion Symposium and  
Proceedings of the Combustion Institute 2020)



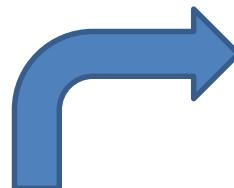
THFA (~20%)



CH<sub>4</sub>  
O<sub>2</sub>

N<sub>2</sub> (~77%)

Premixed flame  
Laminar  
Stoichiometric  
P=40 Torr



### Detailed kinetic model

2567 reactions  
419 species  
(previous work)

347 reactions  
60 species  
(newly added)

Main mechanism



GC analyses

Detector: TCD, **methanizer/FID**, MS

Column: Rt-QBond, MS5A, HayeSep Q

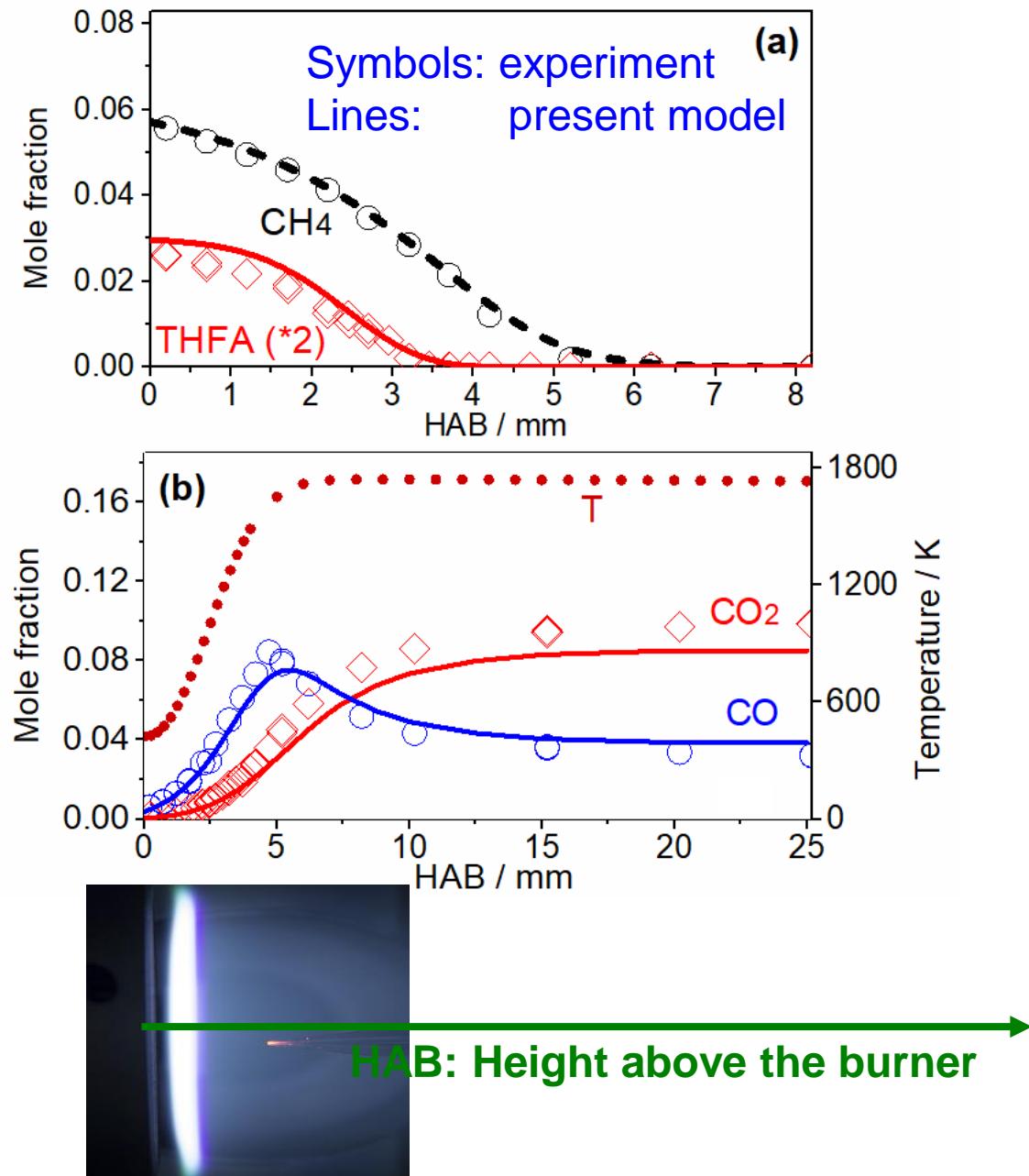
Better understanding  
the combustion  
chemistry of THFA

Carbon balance = 100±2%

# Selected results: Combustion chemistry of THFA

Profiles of fuels,  
 $\text{CO}$ ,  $\text{CO}_2$ ,  $T^\circ$ :

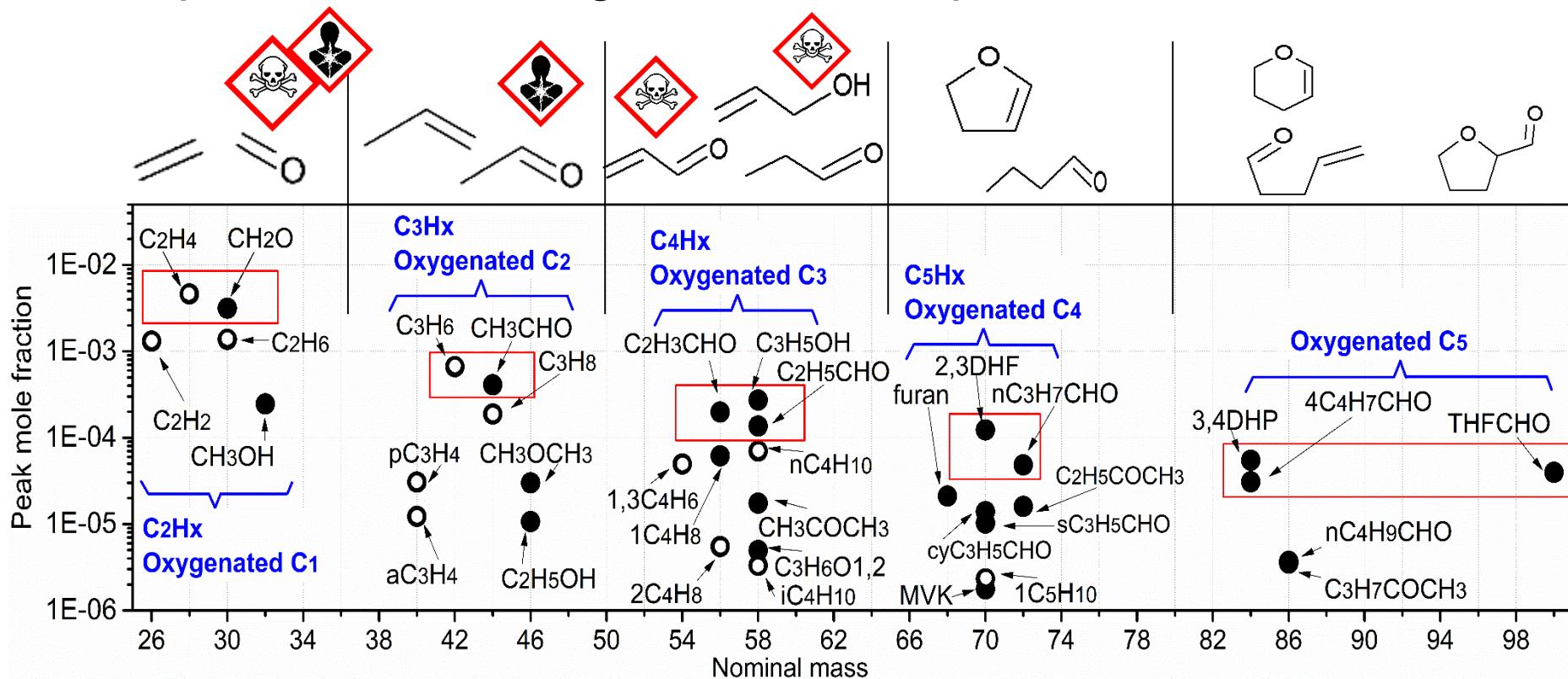
Flame temperature was measured using NO-LIF and thermocouple



# Selected results: Combustion chemistry of THFA

## Exp. detected intermediates (35 species):

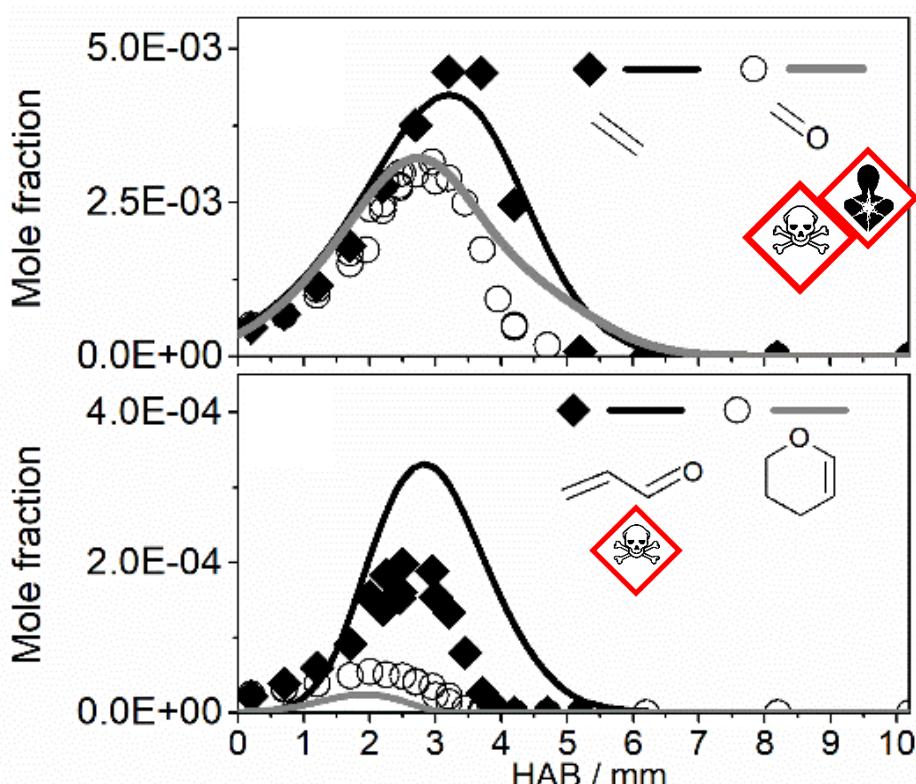
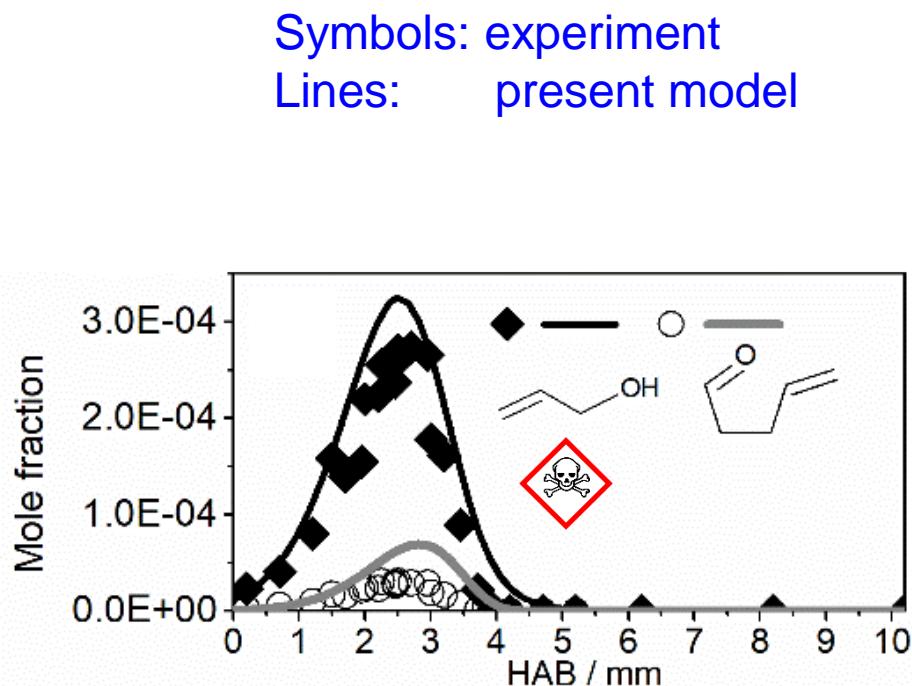
- Important in analyzing reaction mechanism of fuel
- Necessary in validating the kinetic model
- Important in knowing the nature of pollutants



# Selected results: Combustion chemistry of THFA

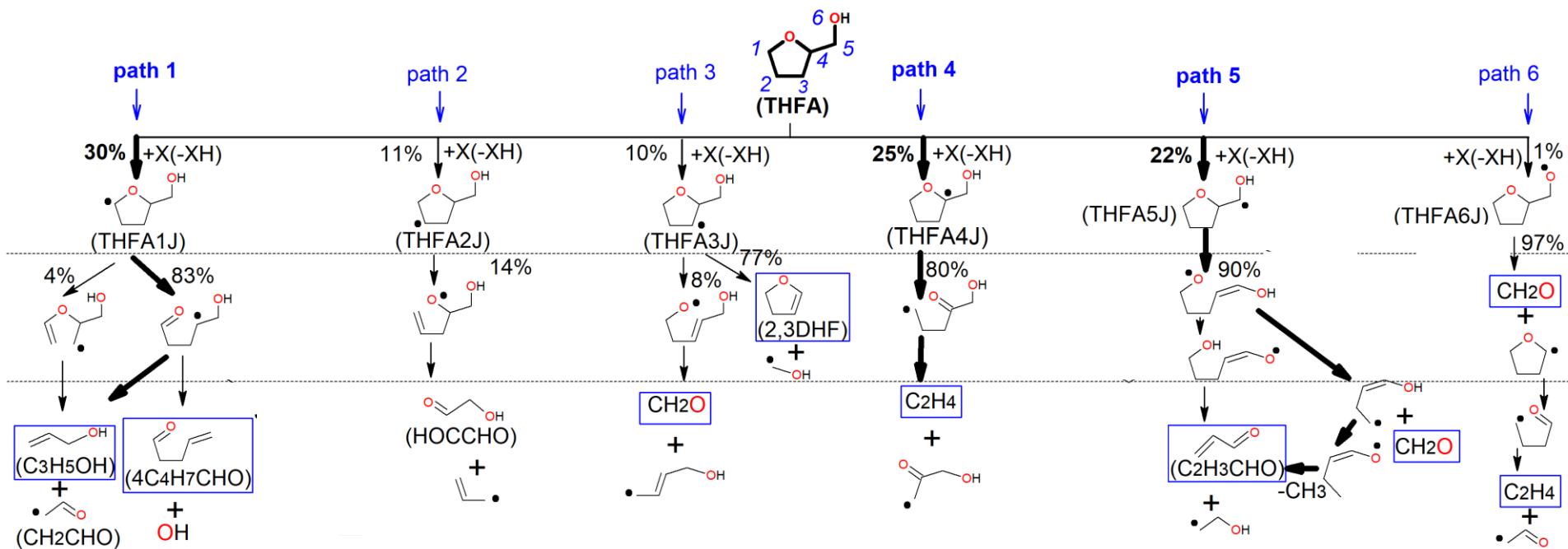
Experiment and model comparison (selected species):

Good agreement between the model and the experiment



# Selected results: Combustion chemistry of THFA

## (Simplified) reaction pathways of THFA (at 1100 K, HAB=2.8mm):



Needs:

- => engine tests before using safely in practice
- => comparison to other THF biofuels
- => study under soot formation conditions

**Merci pour votre attention**