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1. Context

- Hydrogen as a fuel additive
 - ⌚ Non carbonaceous species
 - ⌚ High LHV (120MJ/kg)
 - ⌚ High flammability limit
 - ⌚ High flame speed
 - GN (Natural Gas)
 - Large reserve
 - Main compound: CH_4
 - Low CO_2 emission
- $\text{H}_2 + \text{NG} \rightarrow \text{Credible Transition Solution}$
- Automotive engines
 - Gas turbines
 - Industrial and domestic burners

2. Objective

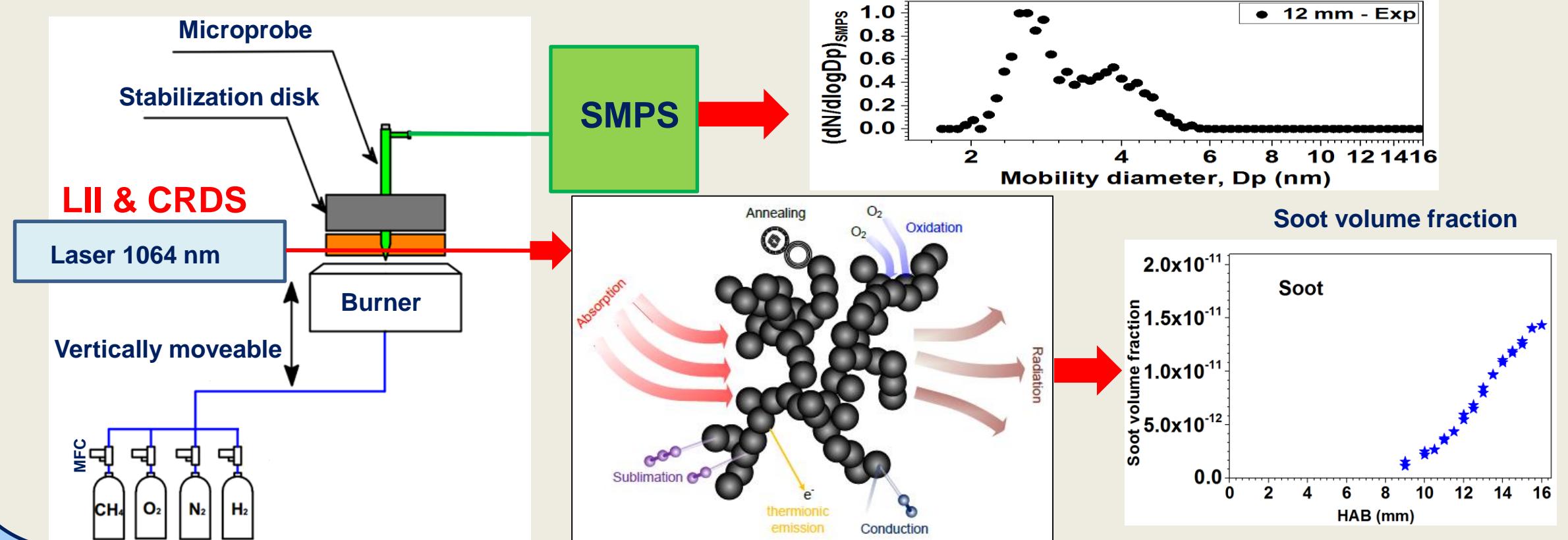
- ✓ Co-combustion properties of H_2 and CH_4 on emission of :
 - Soot particles
 - Soot precursors
 - CO , CO_2

3. Flame condition

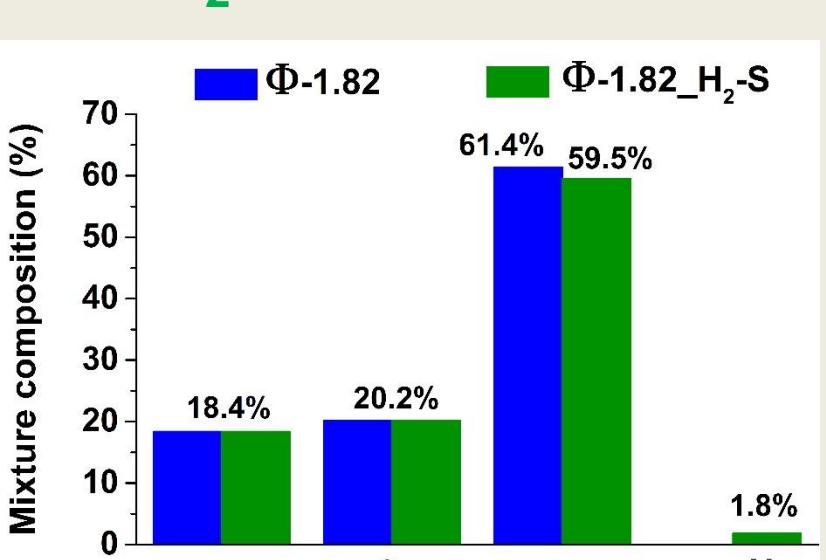


4. Experimental section

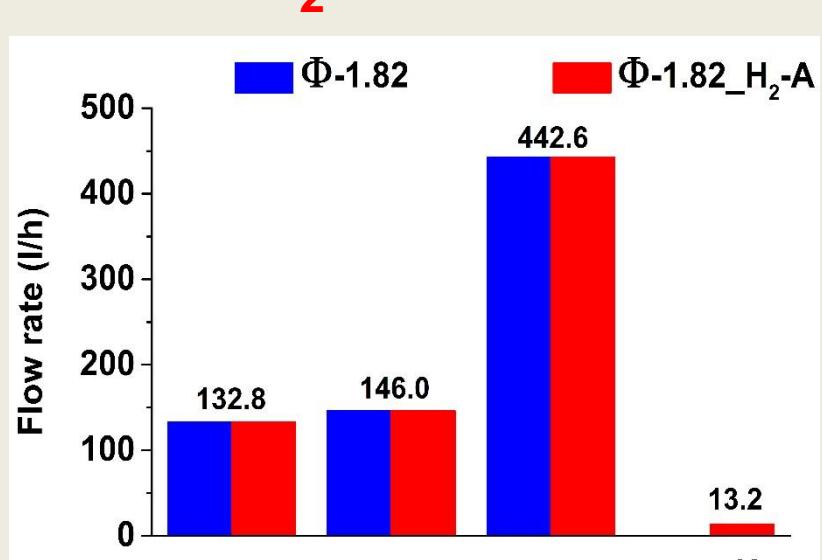
Soot measurements



H_2 Substitution

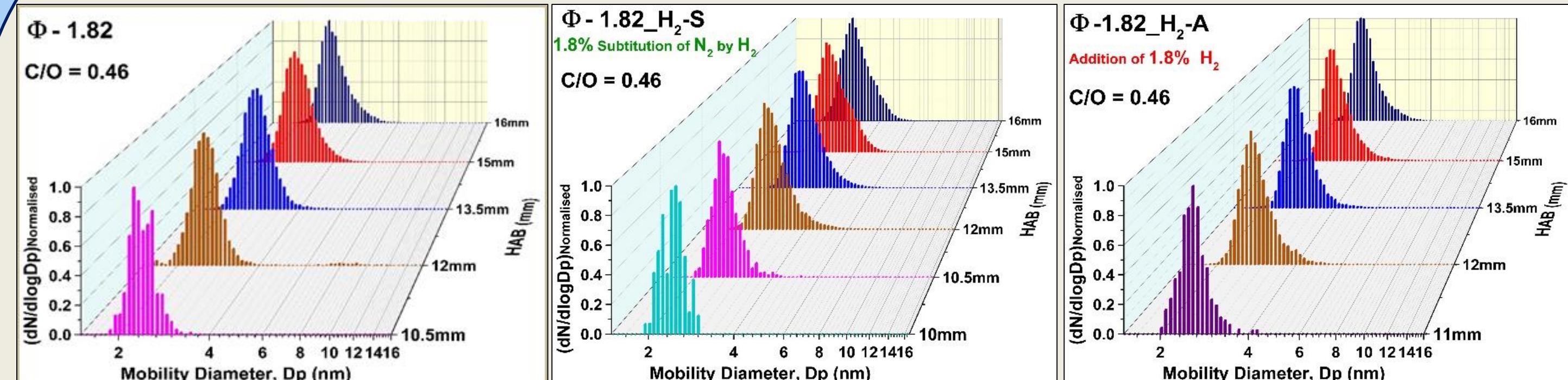


H_2 Addition



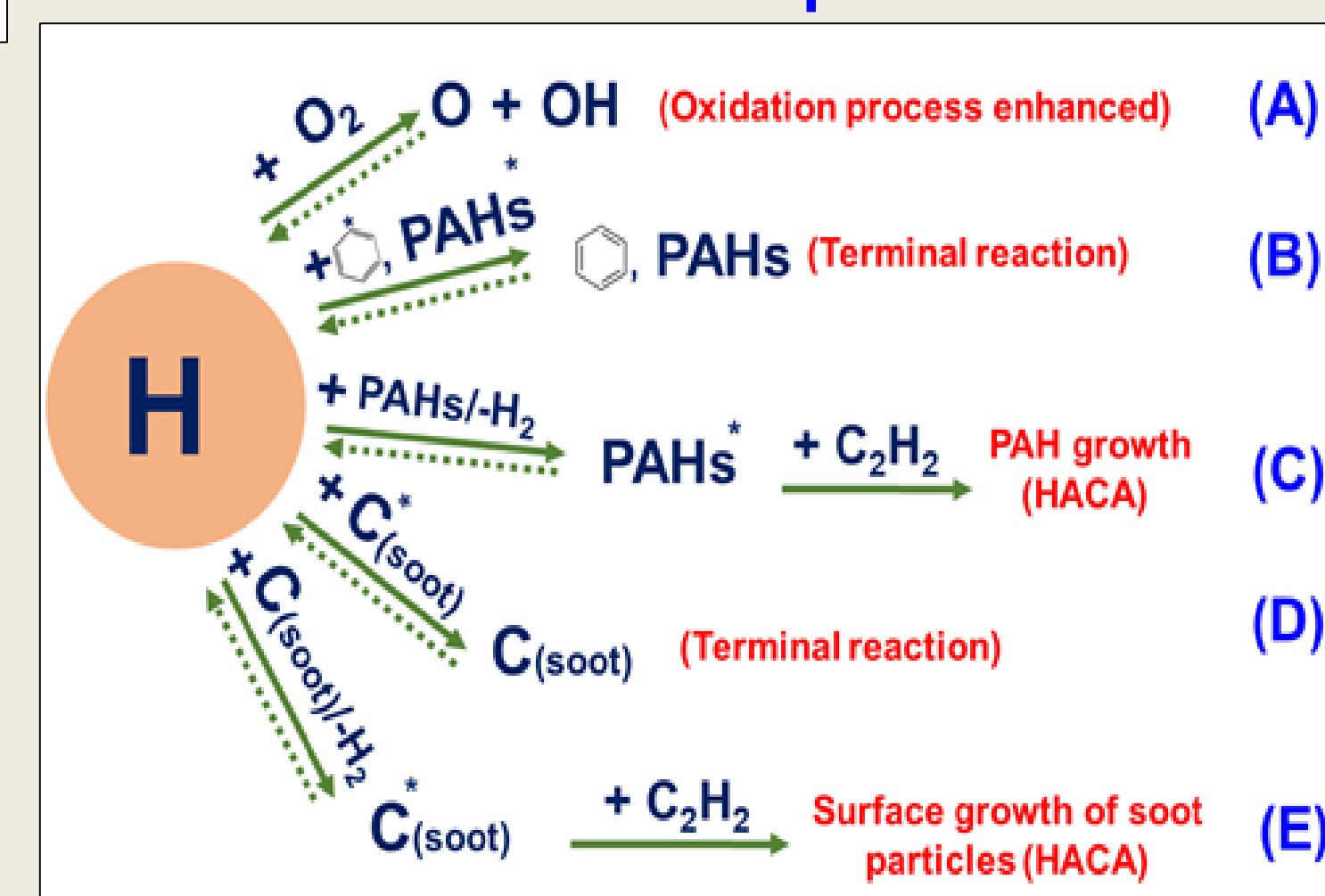
5. Results

➤ Soot particle size distribution function (PSDF)



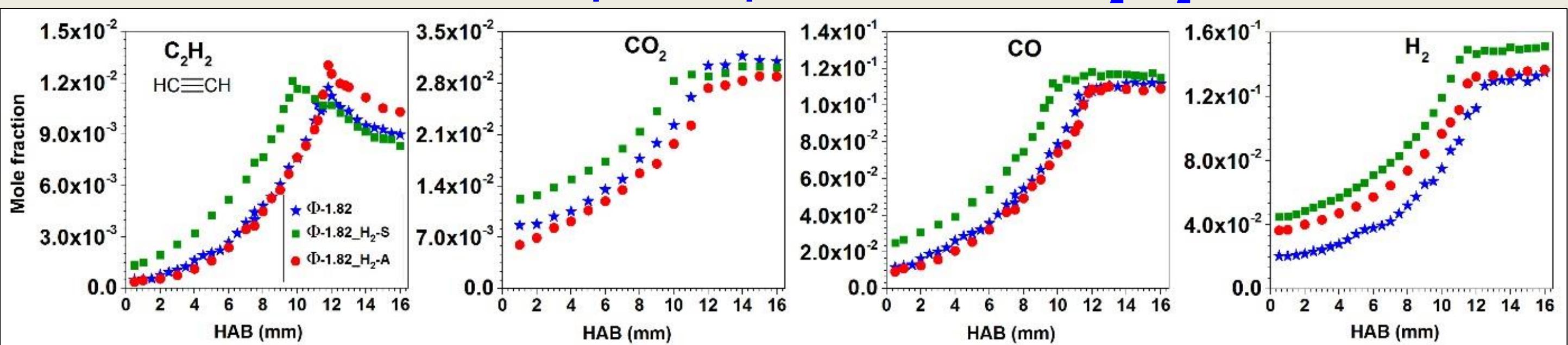
Small impact on PSDF

➤ Kinetic impact of hydrogen atom on soot formation process



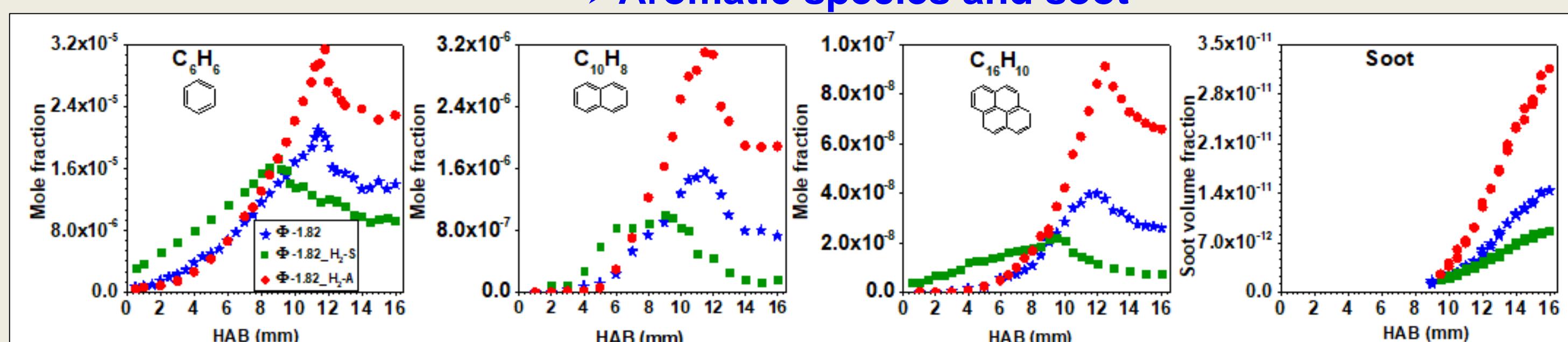
Small impact on formation of aliphatic species and CO , CO_2 , H_2

➤ Aliphatic species and CO , CO_2 , H_2



Small impact on formation of aliphatic species and CO , CO_2 , H_2

➤ Aromatic species and soot



Change of soot volume fractions profiles essentially depending on aromatic species concentrations

Aromatic species and soot formation strongly impacted by H_2 introduction

6. Conclusion

- The H_2 introduction into slight sooting premixed flames of methane strongly influences the formation of soot and their precursors
- This impact depends on the operating conditions (addition or substitution)