Biofuels are gaining increased attention as an alternative to fossil fuels in order to address the climate change issue and energy security. Biofuels may produce less net carbon dioxide emissions than oil-based conventional fuels. There is also a general idea about their ability to reduce exhaust emissions.

Experiments performed in laboratory-scale experiments and in engines have shown that the effect of biofuels on the formation of particulate matter is controversial. In this study: the role of ethanol, dimethyl-ether, furan, 2-methyl furan and 2,5-dimethyl furan on the formation of particulate matter is investigated in premixed and opposed-flow diffusion flames by using in situ optical techniques, differential mobility particle sizer and off-line chemical characterization.

**BIOFUELS**
- ETHANOL (E0H)
- DIMETHYL-ETHER (DMF)
- FURAN (F)
- METHYFURAN (MF)
- 2,5 DIMETHYL FURAN (DMF)

**SOOT DEPOSITION ON QUARTZ DISKS**

**DIAGNOSTIC TOOLS**

**OFF-LINE ANALYSES**

**IN-SITU SPECTROSCOPY**
- LIF (Laser Induced Fluorescence)
- LII (Laser Induced Incandescence)

**PREMIXED FLAMES**

- with respect to Ethylene flame:
  - decrease of LIF UV and LIF Vis
  - strong decrease of LII

**THE CASE OF ETHYLENE/DIMETHYL FURAN (80/20%)**

**IN-SITU SPECTROSCOPY**

**OPPOSED-FLOW DIFFUSION FLAMES**

**DIFFERENTIAL MOBILITY PARTICLE SIZER**

**CONCLUSIONS**
- In premixed flame conditions biofuels are more effective on large particles reduction; also for high addition of biofuel sub-10 nm particles are still produced.
- In opposed-flow diffusion flames, the operating conditions typical of practical combustion systems, biofuels act as enhancers of sub-10 nm particles production.
- Particles larger than 10 nm produced in biofuel flames present enhanced absorption characteristics of oxygenated functionalities.
- In practical conditions (Diesel engine) the addition of biofuel (RME) strongly reduces the >10 nm particles.

**REFERENCES**
- C. Russo, A. D’Anna, A. Ciajolo, M. Signore, Analysis of the chemical features of particles generated from ethylene and ethylene/2,5-dimethylfuran flames, Combust. Flame, 167 (2016) 368–379.