

Generation of Characterised Soot Particles

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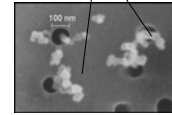
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Smoke and Soot Particle



The main component of smoke
Soot particle – visible or invisible



Particles used for test and calibration

Non-soot particles

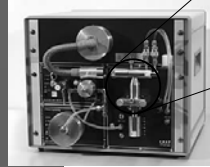
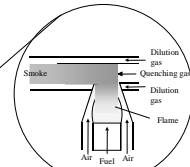


Real soot particles



CAST – a generator of real soot particle

- CAST = Combustion Aerosol Standard
- Soot particles are
 - generated in a diffusion flame
 - quenched subsequently
- Product = real smoke

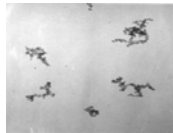


Features of CAST

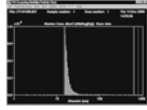
Steady soot generating with high reproducibility



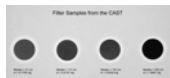
Reference soot particle



Particle size adjustable (20 – 300 nm)

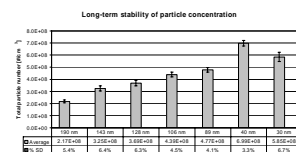
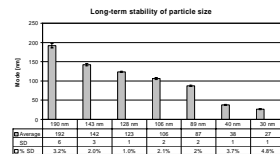


Soot sample with adjustable composition



Long-term stability

test duration: 1 year



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Use of the CAST

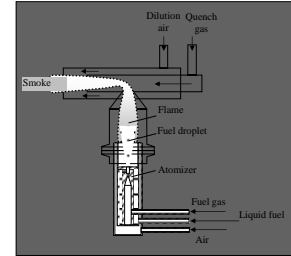
stable, reproducible and comparable soot source

- Calibration of particle measuring instrument
- Aerosol Research
- Toxicological analysis
- Filter testing

User: CH, D, A, GB, I, GR, JAP, USA, Korea

CAST-L for liquid fuel

New possibility to investigate soot from different fuel under controllable and comparable conditions



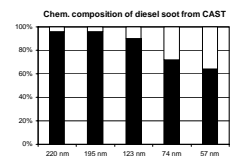
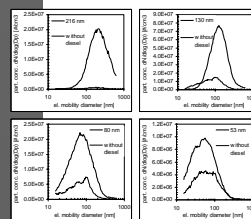
Applications of CAST-L

Independent from engine type

- Comparison of fuel in regards to their sooting potential
- Investigation of the influences on soot emissions due to fuel quality (a cheaper and more efficient alternative)
- Investigation of the influences of fuel additives
- Reference soot and particle for research and calibration purposes

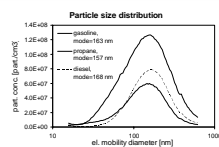
Examples of diesel soot

1. Adjustable particle size
2. Diesel soot predominant
3. Soot from smaller mean size contains more OC.



PAH analysis – Part 1

1. Soot from diffusion flame of
 - Gasoline (direct injection)
 - Propane
 - Diesel
2. Mode of 3 size distributions are placed close to each other.
3. Gasoline soot contains more OC than diesel soot.
4. Soot from gaseous fuel is drier than from liquid fuel.

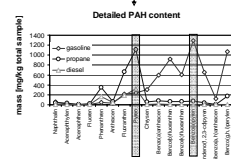
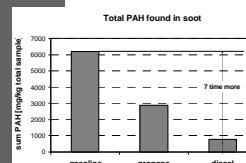
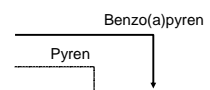


soot type	EC	OC
gasoline	93%	7%
diesel	96%	4%
propane	98%	2%

PAH analysis : Part 2

1. Gasoline soot contains (7x) more PAH than diesel soot. (more harmful than Diesel soot).
2. Predominance

Gasoline soot: large PAH
Diesel soot: small PAH



Generation of Characterised Soot Particles

Different types of CAST

High Volume CAST
Smoke > 1000 l/min



Mini CAST
Smoke: 30 l/min



CAST
Smoke: 30 l/min



Smoke pistol
2-10 l/min



More information

Matter Engineering Ltd
www.matter-engineering.com

Jing Ltd
www.sootgenerator.com



Conclusion

- CAST is not only a reference particle generator, but also an appropriate device to investigate soot formation and particle emission..

Thank you for your attention!