Research on Combustion Generated Nanoparticles at EMPA

Laboratory for I.C. Engines

Empa is a public research institution that is mainly active in the field of materials and environmental science. In the current strategic R&D program Technosphere-Atmosphere, the creation and emission of pollutants as a result of human activity is studied to better understand the processes involved, and simultaneously, to find innovative solutions to the problems of reducing pollutant concentrations in the atmosphere.

Examples of current research projects:

Development of a measurement procedure for particle number counting for type approval purpose

Studies in the frame programme PMP under the auspices of the UNECE WP29 GRPE

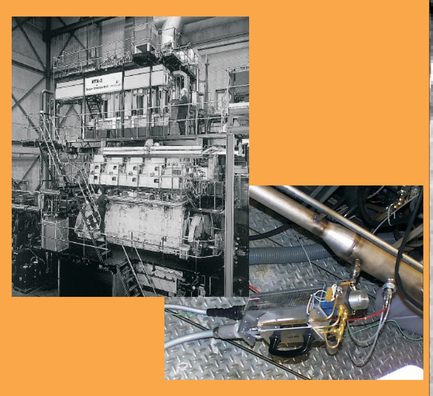
Sampling and conditioning
Qualitiy control
Instrument specification
Calibration

Project partners:
BUWAL RWTÜV
ASTRA Ricardo
AFHB JRC, Ispra
METAS

Particle formation in a low speed 2-stroke marine diesel engine (6 MW)

Study on particle emission with focus on evaluation of most relevant parameters

Detailed chemical and physical analysis
Free variation of combustion parameters
Fuel and lub oil variation

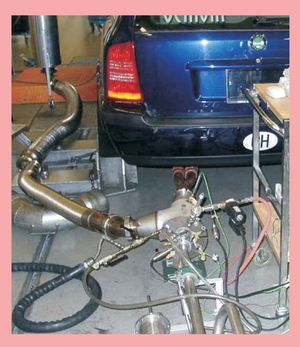


Project partners:
HERCULES intergr. Project within 6th FP of EU
Wärtsilä, Finland
LAV/ETH Zurich Prof. Boulouchos

Formation of volatile particles in the exhaust gas of vehicles

Study on volatile particle emission with focus on influenceing parameters

Detailed physical analysis
Free variation of sampling parameters
Doping experiments

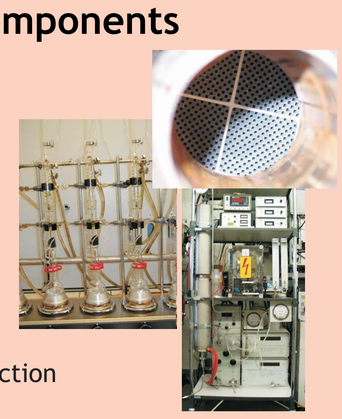


Project partners:
PARTICULATES intergr. Project of 5th FP of EU
Aristoteles University, Thessaloniki, Prof. Samaras
Tampere University, Finland, Prof. Keskinen
Lab for org. chemistry/ETH Zurich, Prof. Zenobi

Impact of new aftertreatment, fuel, and combustion concepts on particle and gaseous emissions

Detailed physical and chemical characterisation of particulate and gaseous exhaust gas components

Characterisation of DPF, SCR, TWC systems
High time resolution measurements
Measurement of non-regulated components
Variation of engine calibration

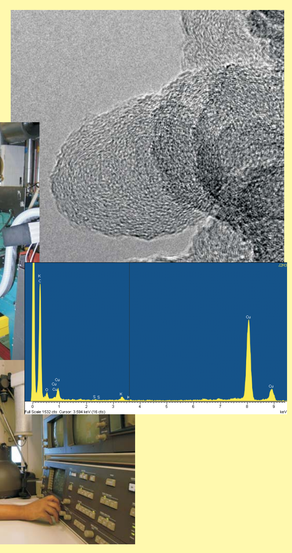


Methods:
SMPS, CPC, DC, ELPI, MSS, Impactors, PAS, TEM, SEM
TC, IC, CI-MS, HPLC, HPLC-MS, GC-MS, ICP-MS, Soxhlet extraction

Soot formation and oxidation in a 4-stroke HD diesel engine

Study on single particle analysis with focus on Transmission Electron Microscopy (TEM)

In-cylinder sampling
Free variation of combustion parameters
Optical access multi-wavelength detection



Methods:
High resolution TEM (HR-TEM)
Electron Energy Loss Spectroscopy (EELS)
Energy Dispersive X-ray Spectroscopy (EDX)
Radial distribution Function (RDF)

Project partners:
CIME/EPF Lausanne Prof. Buffat
LAV/ETH Zurich Prof. Boulouchos

Fate of particles from road traffic exhaust in the atmosphere

Study on particle transformation at the interface emission to atmosphere

Comparison of dynamometric tests and chasing experiments
Detailed physical and chemical analysis
Near source atmospheric measurements
Model development

Project partners:
PSI Villingen PD Urs Baltensperger
ETH Zurich Prof. U. Lohmann

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