Particle charge-size distribution measurement using a differential mobility analyzer and an electrical low pressure impactor

General information
State: E-pub ahead of print
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research area: Aerosol Physics, Research group: The Instrumentation, Emissions, and Atmospheric Aerosols Group
Authors: Järvinen, A., Heikkilä, P., Keskinen, J., Yli-Ojanperä, J.
Publication date: 2 Nov 2016
Peer-reviewed: Yes

Publication information
Journal: Aerosol Science and Technology
ISSN (Print): 0278-6826
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 0.943 0.853
Publication Forum (2016): 2
Scopus rating (2015): 1.284 1.009
Web of Science (2015): 1.953 2.721 9.8 0.323 0.00876 0.886
Publication Forum (2015): 2
Scopus rating (2014): 1.365 1.099
Web of Science (2014): 2.413 2.751 9.3 0.41 0.00993 0.979
Publication Forum (2014): 2
Scopus rating (2013): 1.521 1.514
Publication Forum (2013): 2
Scopus rating (2012): 1.408 1.038
Publication Forum (2012): 2
Scopus rating (2011): 1.137 0.927
Scopus rating (2010): 1.132 0.742
Scopus rating (2009): 1.568 0.871
Scopus rating (2008): 1.813 1.106
Scopus rating (2007): 1.99 1.189
Scopus rating (2006): 1.638 1.197
Scopus rating (2005): 1.234 0.93
Scopus rating (2004): 1.825 1.447
Scopus rating (2003): 1.935 1.243
Scopus rating (2002): 1.923 1.246
Scopus rating (2001): 1.193 1.318
Scopus rating (2000): 1.328 1.441
Scopus rating (1999): 1.344 0.926
Original language: English
DOIs:
10.1080/02786826.2016.1256469
Research output: Scientific - peer-review › Article

Exhaust particle and NOx emission performance of an SCR heavy duty truck operating in real-world conditions

Particle and NOx emissions of an SCR equipped HDD truck were studied in real-world driving conditions using the "Sniffer" mobile laboratory. Real-time CO2 measurement enables emission factor calculation for NOx and particles. In this study, we compared three different emission factor calculation methods and characterised their suitability for real-world chasing experiments. The particle number emission was bimodal and dominated by the nucleation mode particles (diameter below 23 nm) having emission factor up to $1 \times 10^{15}$ particles/kg fuel whereas emission factor for soot (diameter above 23 nm that is consistent with the PMP standard) was typically $1 \times 10^{14}$ particles/kg fuel. The effect of thermodenuder on the exhaust particles indicated that the nucleation particles consisted mainly of volatile compounds, but sometimes there also existed a non-volatile core. The nucleation mode particles are not controlled by current regulations in Europe. However, these particles consistently form under atmospheric dilution in the plume of the truck and constitute a health risk for the human population that is exposed to those. Average NOx emission was 3.55 g/kWh during the test, whereas the Euro IV emission limit over transient testing is 3.5 g NOx/kWh. The on-road emission performance of the vehicle was very close to the expected levels, confirming the successful operation of the SCR system of the tested vehicle. Heavy driving conditions
such as uphill driving increased both the NOx and particle number emission factors whereas the emission factor for soot particle number remains rather constant.

**General information**

State: Published

Ministry of Education publication type: A1 Journal article-refereed

Organisations: Department of Physics, Research area: Aerosol Physics, Research group: The Instrumentation, Emissions, and Atmospheric Aerosols Group, Laboratory of Applied Thermodynamics, Aristotle University of Thessaloniki, University of Helsinki, Dinex Ecocat Oy

Authors: Saari, S., Karjalainen, P., Ntziachristos, L., Pirjola, L., Matilainen, P., Keskinen, J., Rönkkö, T.

Keywords: (Emission factor, Nucleation mode, Particle number, Selective catalytic reduction, Volatile compound)

Pages: 136-144

Publication date: 2016

Peer-reviewed: Yes

Early online date: 2 Dec 2015

ASJC Scopus subject areas: Atmospheric Science, Environmental Science(all)

**Publication information**

Journal: Atmospheric Environment

Volume: 126

ISSN (Print): 1352-2310

Ratings:

Publication Forum (2017): 1

Scopus rating (2016): 1.466 1.593

Publication Forum (2016): 1

Scopus rating (2015): 1.759 1.597

Web of Science (2015): 3.459 3.841 8.0 0.898 0.06271 1.057

Publication Forum (2015): 1

Scopus rating (2014): 1.593 1.67

Web of Science (2014): 3.281 3.78 7.9 0.603 0.06315 1.047

Publication Forum (2014): 2

Scopus rating (2013): 1.753 1.63

Publication Forum (2013): 2

Scopus rating (2012): 1.968 1.699

Publication Forum (2012): 2

Scopus rating (2011): 1.982 1.78

Scopus rating (2010): 1.894 1.489

Scopus rating (2009): 1.945 1.466

Scopus rating (2008): 1.866 1.594

Scopus rating (2007): 1.961 1.56

Scopus rating (2006): 1.874 1.587

Scopus rating (2005): 1.893 1.6

Scopus rating (2004): 1.969 1.779

Scopus rating (2003): 1.946 1.607

Scopus rating (2002): 2.027 1.611

Scopus rating (2001): 1.947 1.705

Scopus rating (2000): 1.898 1.621

Scopus rating (1999): 2.046 1.407

Original language: English

DOIs:

10.1016/j.atmosenv.2015.11.047

Source: Scopus

Source-ID: 84949921381

Research output: Scientific - peer-review > Article

**Measurement of aerosol charge distributions**

**General information**

State: Published
Particle emission from loaders using normal and bio based diesel fuels

General information
State: Published
Organisations: Department of Physics, Research area: Aerosol Physics, Research group: The Instrumentation, Emissions, and Atmospheric Aerosols Group, Neste Oil Oyj, VTT Tech Res Ctr Finland, VTT Technical Research Center Finland
Authors: Järvinen, A. R., Wihersaari, H., Karjalainen, P. A., Nuottimäki, J., Kytö, M., Keskinen, J. O., Rönkkö, T. S.
Publication date: 2016
Peer-reviewed: Unknown
Event:
Links:
Research output: Professional › Paper, poster or abstract

The formation and physical properties of the particle emissions from a natural gas engine

Natural gas engine particle emissions were studied using an old gasoline engine modified to run with natural gas. The tests were steady-state tests performed on two different low loads in an engine dynamometer. Exhaust particle number concentration, size distribution, volatility and electric charge were measured. Exhaust particles were observed to have peak diameters below 10 nm. To get the full picture of particle emissions from natural gas engines, size range 1-5 nm is relevant and important to take into consideration. A particle size magnifier (PSM) was used in this engine application for measuring particles smaller than 3 nm and it proved to be a useful instrument when measuring natural gas engine exhaust particles. It is concluded that the detected particles probably originated from the engine cylinders or their vicinity and grew to detectable sizes in the sampling process because a small fraction of the particles were observed to carry electric charge and the particles did not evaporate totally at 265°C.

General information
State: Published
Organisations: Department of Physics, Research area: Aerosol Physics, Research group: The Instrumentation, Emissions, and Atmospheric Aerosols Group, Engineering materials science and solutions (EMASS), Urban circular bioeconomy (UrCirBio), Atmospheric Composition Research, VTT Technical Research Centre of Finland, Finnish Meteorological Institute
Authors: Alanen, J., Saukko, E., Lehtoranta, K., Murtonen, T., Timonen, H., Hillamo, R., Karjalainen, P., Kuuluvainen, H., Harra, J., Keskinen, J., Rönkkö, T.
Keywords: (Fine particle emission, Internal combustion engine, Natural gas, Particle formation)
Number of pages: 7
Pages: 155-161
Publication date: 15 Dec 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Fuel Technology, Energy Engineering and Power Technology, Chemical Engineering(all), Organic Chemistry

Publication information
Journal: Fuel
Volume: 162
ISSN (Print): 0016-2361
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.744 2.179
Publication Forum (2016): 2
Scopus rating (2015): 1.809 2.125
Changes in traffic systems and vehicle emission reduction technologies significantly affect traffic-related emissions in urban areas. In many densely populated areas the amount of traffic is increasing, keeping the emission level high or even increasing. To understand the health effects of traffic related emissions, both primary and secondary particles that are formed in the atmosphere from gaseous exhaust emissions need to be characterized. In this study we used a comprehensive set of measurements to characterize both primary and secondary particulate emissions of a modern gasoline passenger car. Our aerosol particle study covers the whole process chain in emission formation, from the engine to the atmosphere, and takes into account also differences in driving patterns. We observed that in mass terms, the amount of secondary particles was 13 times higher than the amount of primary particles. The formation, composition, number, and mass of secondary particles was significantly affected by driving patterns and engine conditions. The highest gaseous and particulate emissions were observed at the beginning of the test cycle when the performance of the engine and the catalyst was below optimal. The key parameter for secondary particle formation was the amount of gaseous hydrocarbons in primary emissions; however, also the primary particle population had an influence. Thus, in order to enhance human health and wellbeing in urban areas, our study strongly indicates that in future legislation, special attention should be directed into the reduction of gaseous hydrocarbons.

**General information**

**State:** Published

**Ministry of Education publication type:** A1 Journal article-refereed

**Organisations:** Department of Physics, Research area: Aerosol Physics, Finnish Meteorological Institute, Helsinki, VTT Technical Research Centre of Finland, Pennsylvania State University


**Number of pages:** 29

**Pages:** 33253-33282

**Publication date:** 25 Nov 2015

**Peer-reviewed:** Yes
Characterization of trace metals on soot aerosol particles with the SP-AMS: Detection and quantification

A method to detect and quantify mass concentrations of trace metals on soot particles by the Aerodyne soot-particle aerosol mass spectrometer (SP-AMS) was developed and evaluated in this study. The generation of monodisperse Regal black (RB) test particles with trace amounts of 13 different metals (Na, Al, Ca, V, Cr, Mn, Fe, Ni, Cu, Zn, Rb, Sr and Ba) allowed for the determination of the relative ionization efficiency of each metal relative to black carbon (RIE(meas)). The observed RIE(meas)/RIEtheory values were larger than unity for Na, Rb, Ca, Sr and Ba due to thermal surface ionization (TSI) on the surface of the laser-heated RB particles. Values closer to unity were obtained for the transition metals Zn, Cu, V and Cr. Mn, Fe, and Ni presented the lowest RIE(meas)/RIEtheory ratios and highest deviation from unity. The latter discrepancy is unexplained; however it may be related to problems with our calibration method and/or the formation of metal complexes that were not successfully quantified. The response of the metals to the laser power was investigated and the results indicated that a minimum pump laser current of 0.6 A was needed in order to vaporize the metals and the refractory black carbon (rBC). Isotopic patterns of metals were resolved from high-resolution mass spectra, and the mass-weighted size distributions for each individual metal ion were obtained using the high-resolution particle time-of-flight (HR-PToF) method. The RIE(meas) values obtained in this study were applied to the data of emission measurements in a heavy-fuel-oil-fired heating station. Emission measurements revealed a large number of trace metals, including evidence for metal oxides and metallic salts, such as vanadium sulfate, calcium sulfate, iron sulfate and barium sulfate, which were identified in the SP-AMS high-resolution mass spectra. SP-AMS measurements of Ba, Fe, and V agreed with ICP-MS analyzed filter samples within a factor of 2 when emitted rBC mass loadings were elevated.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research area: Aerosol Physics, Urban circular bioeconomy (UrCirBio), University of São Paulo, Aerodyne Research Inc., Finnish Meteorological Institute, University of Colorado at Boulder, University of Helsinki, Helen Ltd.
Authors: Carbone, S., Onasch, T., Saarikoski, S., Timonen, H., Saarnio, K., Sueper, D., Rönkkö, T., Pirjola, L., Häyrinen, A., Worsnop, D., Hillamo, R.
Number of pages: 13
Pages: 4803-4815
Publication date: 18 Nov 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Atmospheric Science

Publication information
Journal: Atmospheric Measurement Techniques
Volume: 8
Issue number: 11
ISSN (Print): 1867-1381
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.956 1.612
Publication Forum (2016): 1
Scopus rating (2015): 2.019 1.433
Web of Science (2015): 2.989 3.489 3.2 0.807 0.01845 1.167
Publication Forum (2015): 1
Scopus rating (2014): 2.116 1.561
Web of Science (2014): 2.929 3.368 3.0 0.533 0.01589 1.233
Laastien vedenimukertoimen määrittämisen virhelähdekokeet

**General information**
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Civil Engineering
Authors: Tuominen, E., Vinha, J.
Keywords: (Double skin facade, Energy efficiency, New renovation consepts, Innovative HVAC, Earth to air heat exchanger)
Number of pages: 6
Pages: 239-244
Publication date: 20 Oct 2015

**Host publication information**
Title of host publication: Rakennusfysiikka 2015. Uusimmat tutkimustulokset ja hyvät käytännön ratkaisut. 20.-22.10.2015, Tampere
Place of publication: Tampere
Publisher: Tampereen teknillinen yliopisto, rakennustekniikan laitos, rakennetekniikka
Editors: Vinha, J., Ruuska, T.
Research output: Scientific › Conference contribution

Muuttuvat ajotilanteet aiheuttavat uudentyyppisiä ajoneuvojen hiukkaspäästöjä

**General information**
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Physics, Research area: Aerosol Physics
Authors: Karjalainen, P.
Number of pages: 4
Pages: 28-31
Publication date: 12 Oct 2015
Peer-reviewed: Unknown

**Publication information**
Journal: Ympäristö ja terveys
Volume: 46
Issue number: 6
ISSN (Print): 0358-3333
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Publication Forum (2015): 0
Original language: Finnish
Research output: Professional › Article
Generation of characteristic traffic emission aerosol in particulate filter collection efficiency tests

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Physics, Research area: Aerosol Physics, Urban circular bioeconomy (UrCirBio), VTT Technical Research Centre of Finland
Authors: Saari, S., Karjalainen, P., Kalliohaka, T., Taipale, A., Rönkkö, T.
Publication date: Oct 2015

Host publication information
Title of host publication: The 11th International Conference on Industrial Ventilation, Shanghai, China
Links:
http://www.scopus.com/inward/record.url?scp=84988008282&partnerID=8YFLogxK

Bibliographical note
ISBN kysytty, HO.
Ei ole, HO.
Research output: Professional › Conference contribution

Modelling the contribution of biogenic volatile organic compounds to new particle formation in the Jülich plant atmosphere chamber
We used the Aerosol Dynamics gas- and particle-phase chemistry model for laboratory CHAMber studies (ADCHAM) to simulate the contribution of BVOC plant emissions to the observed new particle formation during photooxidation experiments performed in the Jülich Plant- Atmosphere Chamber and to evaluate how well smog chamber experiments can mimic the atmospheric conditions during new particle formation events. ADCHAM couples the detailed gas-phase chemistry from Master Chemical Mechanism with a novel aerosol dynamics and particle phase chemistry module. Our model simulations reveal that the observed particle growth may have either been controlled by the formation rate of semi- and low-volatility organic compounds in the gas phase or by acid catalysed heterogeneous reactions between semi-volatility organic compounds in the particle surface layer (e.g. peroxyhemiacetal dimer formation). The contribution of extremely low-volatility organic gas-phase compounds to the particle formation and growth was suppressed because of their rapid and irreversible wall losses, which decreased their contribution to the nano-CN formation and growth compared to the atmospheric situation. The best agreement between the modelled and measured total particle number concentration (R>0.95) was achieved if the nano-CN was formed by kinetic nucleation involving both sulphuric acid and organic compounds formed from OH oxidation of BVOCs.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research area: Aerosol Physics, Urban circular bioeconomy (UrCirBio), University of Helsinki, Lund Univ, Lund University, Division of Nuclear Physics, Institute for Energy- and Climate Research (IEK-8), Forschungszentrum Jülich (FZJ), Institute of Biogeosciences (IBG-2)
Number of pages: 22
Pages: 10777-10798
Publication date: 28 Sep 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Atmospheric Science

Publication information
Journal: Atmospheric Chemistry and Physics
Volume: 15
Issue number: 18
ISSN (Print): 1680-7316
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 3.264 1.756
Publication Forum (2016): 3
Scopus rating (2015): 3.308 1.531
Web of Science (2015): 5.114 5.626 4.9 1.184 0.09839 1.719
Model studies of volatile diesel exhaust particle formation: Are organic vapours involved in nucleation and growth?

A high concentration of volatile nucleation mode particles (NUP) formed in the atmosphere when the exhaust cools and dilutes has hazardous health effects and it impairs the visibility in urban areas. Nucleation mechanisms in diesel exhaust are only poorly understood. We performed model studies using two sectional aerosol dynamics process models AEROFOR and MAFOR on the formation of particles in the exhaust of a diesel engine, equipped with an oxidative after-treatment system and running with low fuel sulfur content (FSC) fuel, under laboratory sampling conditions where the dilution system mimics real-world conditions. Different nucleation mechanisms were tested. Based on the measured gaseous sulfuric acid (GSA) and non-volatile core and soot particle number concentrations of the raw exhaust, the model simulations showed that the best agreement between model predictions and measurements in terms of particle number size distribution was obtained by barrier-free heteromolecular homogeneous nucleation between the GSA and a semi-volatile organic vapour combined with the homogeneous nucleation of GSA alone. Major growth of the particles was predicted to occur due to the similar organic vapour at concentrations of (1-2) × 10^{12} \text{cm}^{-3}. The pre-existing core and soot mode concentrations had an opposite trend on the NUP formation, and the maximum NUP formation was predicted if a diesel particle filter (DPF) was used. On the other hand, the model predicted that the NUP formation ceased if the GSA concentration in the raw exhaust was less than 10^{10} \text{cm}^{-3}, which was the case when biofuel was used.
Modelling new particle formation and growth using combined power law and log-normal distribution model

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Physics, Research area: Aerosol Physics
Authors: Olin, M., Dal Maso, M.
Publication date: 8 Sep 2015

Host publication information
Title of host publication: EAC 2015, European Aerosol Conference
Place of publication: Milan, Italy
Publisher: Italian Aerosol Society
ASJC Scopus subject areas: Pollution
Links:
http://www.eac2015.it/ (Conference website)
Research output: Professional » Conference contribution

Exhaust Particles and NOx Emission Factors of a Modern Heavy Duty Truck equipped with the SCR in Real-world Driving Conditions

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Physics, Research area: Aerosol Physics, Research group: The Instrumentation, Emissions, and Atmospheric Aerosols Group
Studies of Physical Phase State of Aerosol Nanoparticles

Aerosol particles produced in the atmosphere have major effects on the life on Earth: cloud formation starts on seed particles, often formed by photochemical oxidation of biogenic volatile organic compounds; visibility, corrosion, and health problems are caused by anthropogenic hydrocarbon and sulfur emission processed into particles by the atmosphere and the sun.

Naturally occurring secondary organic aerosol (SOA) particles can produce up to a half of the non-refractory mass of aerosol particles of less than micrometer in size. This makes SOA a large contributing factor to the climate system of the Earth. The actual effect that these particles have is, however, not well known, compared to the other effects affecting the climate. The research effort to increase the understanding and reduce the uncertainties around the climate effects of SOA encompasses an interdisciplinary research community.

The recent advance made by the observation of a solid phase of SOA by Virtanen et al. (2010) was the starting point for this thesis. The solid phase of SOA particles means that a long-held assumption of a partition equilibrium between the condensed phase and the gas phase of the semivolatile species may be wrong and produce too low a timescale for the
particle chemical reaction rates and uptake coefficients.

This work consists of new developments in the instrumentation of particle properties as well as new observations of laboratory-generated secondary organic aerosol. The method development has two branches, one concentrates on finding more information from the measurement signal of an electrical low pressure impactor (ELPI) used in a somewhat unconventional way, whereas the other consists of a new detection method for particle bounce and response to different humidity and phase hysteresis induced by a carefully controlled humidity history.

The methods and observations made during this work are by no means the final word on the subject, but they are being used and further developed by the scientific community. Study of the particle phase and bounce as well as SOA mechanical properties and kinetics is well underway, and its results will be used to further refine the understanding of both aerosol fundamentals as well as the climate system.

General information
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Physics, Research area: Aerosol Physics
Authors: Saukko, E.
Number of pages: 51
Publication date: 26 Jun 2015

Publication information
Publisher: Tampere University of Technology
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 1308
ISSN (Print): 1459-2045
Electronic versions:
saukko_1308
Links:

Bibliographical note
Awarding institution:Tampere University of Technology
Versio ok 16.12.2015
Research output: Collection of articles › Doctoral Thesis

Portable emission measurement system (PEMS) for tailpipe and exhaust plume aerosols

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Physics, Research area: Aerosol Physics, Research group: The Instrumentation, Emissions, and Atmospheric Aerosols Group
Keywords: (vehicle emissions, emission measurement)
Publication date: 15 Jun 2015

Host publication information
Title of host publication: Aerosol Technology 2015
Article number: O086
Links:

Bibliographical note
xabstract
Research output: Scientific - peer-review › Conference contribution
Diffusion charger based monitoring of urban aerosols

Modelling particle distribution using combined power-law and log-normal distribution model

Concentration and composition gradients of exhaust and non-exhaust particles near a major road
Detection of the relativistic electrons at atmosphere

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Physics, Sodankylä Geophysical Observatory FIN-99600 Sodankylä Finland
Authors: Gholizadeh-Kalkhoran, H., Turunen, E.
Publication date: 2015

Host publication information
Title of host publication: FINCOSPAR 2015
Links:
http://www.cospar.fi/fincospar2015/
Research output: Professional › Conference contribution

Diesel engine exhaust particle measurements using a particle size magnifier (PSM)

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Physics, Research area: Aerosol Physics, Research group: The Instrumentation, Emissions, and Atmospheric Aerosols Group
Authors: Kuuluvainen, H., Karjalainen, P., Saukko, E., Nousiainen, P., Karhu, T., Pirjola, L., Keskinen, J., Rönkkö, T.
Publication date: 2015

Host publication information
Title of host publication: EAC 2015, European Aerosol Conference, 6-11 September, 2015, Milan, Italy

Bibliographical note
ISBN kysytty, HO.
Ei ole, HO.
Research output: Professional › Conference contribution

Fluorescence-based Real-Time Characterization of Bioaerosols

General information
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Physics, Research area: Aerosol Physics
Authors: Saari, S.
Number of pages: 53
Publication date: 2015

Publication information
Place of publication: Tampere
Publisher: Tampere University of Technology
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 1294
ISSN (Print): 1459-2045

Bibliographical note
Awarding institution: Tampere University of Technology
Research output: Collection of articles › Doctoral Thesis

Gas and particle composition and properties of photochemically aged ship plumes using chemical ionization and aerosol mass spectrometry
Monitoring urban air quality with a diffusion charger based electrical particle sensor

Abstract Urban air contains considerable amounts of harmful gaseous substances and aerosol particles. In this study, a recently introduced diffusion charger based PPS-M particle sensor (Pegasor Oy, Tampere, Finland) was evaluated for outdoor air quality measurements in urban environment. The PPS-M particle sensor was used in two stationary air quality measurement stations, one located in the roadside environment and the other in residential area, and in a mobile laboratory. The sampling of urban aerosol to the PPS-M sensor was performed without any pre-conditioning of aerosol. The sensor response to PM2.5 varied between the measurements, being between 7 and 30 fA/(µg/m³) depending on the aerosol source. The highest PM2.5 response was observed in the roadside study for exhaust particles while the lowest PM2.5 response was observed for large long range transported aerosol particles having relatively large mean particle size. The sensor signal was found to produce very linear response, with only minimal deviation, to the lung deposited particle surface area concentration (from 4.5 to 6 fA/(µm²/cm³)) and to the condensation sink of urban air particles (from 1.0 × 10⁴ to 1.2 × 10⁴ fA cm³). The sensor response to particle number concentration was defined to be 0.0044 fA/(1/cm³) in roadside environment. In this environment, the signal was found to correlate also with NO and NO2 concentrations of roadside air due to the same origin of particulate and gaseous pollutants. Similar correlation between NOx and the PPS-M signal was not observed in residential area.
Seasonal and diurnal variations of fluorescent bioaerosol concentration and size distribution in the urban environment

A recently introduced fluorescence based real-time bioaerosol instrument, BioScout, and an ultraviolet aerodynamic particle sizer (UVAPS) were used to study fluorescent bioaerosol particles (FBAP) in the Helsinki metropolitan area, Finland, during winter and summer. Two FBAP modes at 0.5–1.5 µm (fine) and 1.5–5 µm (coarse) were detected during the summer, whereas the fine mode dominated in the winter. The concentration and proportion of the coarse FBAP was high in summer (0.028#/cm³, 23%) and low in winter (0.010#/cm³, 6%). Snow cover and low biological activity were assumed to be the main reasons for the low coarse FBAP concentration in the wintertime. Both the fine and the coarse FBAP fraction typically increased at nighttime during the summer. Correlations between the BioScout and the UVAPS were high with the coarse (R = 0.83) and fine (R = 0.92) FBAP. The BioScout showed 2.6 and 9.7 times higher detection efficiencies for the coarse and fine FBAP, respectively, compared to the UVAPS. A long-range transport episode of particles from Eastern Europe increased the fine FBAP concentration by over two orders of magnitude compared to the clean period in the winter, but these FBAP probably also included fluorescent non-biological particles. Correlation analysis indicates that local combustion sources did not generate fluorescent non-biological particles that can disturb fine FBAP counting. The results provide information that can be used to estimate health risks and climatic relevance of bioaerosols in the urban environment.
Selvitys UUMA-materiaalien teknisen kelpoisuuden arviointiin liittyvistä testausstandardeista ja -menetelmissä (1. vaihe), 29.12.2014

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Civil Engineering, Research group: Track Structures, Research group: Earth Constructions
Authors: Kuula, P., Kolisoja, P., Sjöberg, M., Ketola, T., Koivisto, K., Forsman, J., Dettenborn, T., Jyvärä, H.
Publication date: 2015

Publication information
Publisher: Ramboll
Original language: Finnish

Publication series
Name: UUMA 2, Uusiomateriaalit maarakentamisessa ohjelma 2013-2015
Publisher: Ramboll
Links:
http://www.uuma2.fi/

Bibliographical note
Contribution: organisation=rak,FACT1=1<br/>Portfolio EDEND: 2015-01-13
Source: researchoutputwizard
Source-ID: 14
Research output: Professional › Commissioned report
The critical velocity of rebound determined for sub-micron silver particles

**General information**
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Physics, Research area: Aerosol Physics, Research group: Aerosol Synthesis, Research group: The Instrumentation, Emissions, and Atmospheric Aerosols Group
Authors: Kuuluvainen, H., Arffman, A., Harra, J., Vuorinen, O., Juuti, J., Yli-Ojanperä, J., Mäkelä, J., Keskinen, J.
Publication date: 2015

**Host publication information**
Title of host publication: AT 2015, Aerosol Technology, June 15-17, 2015, Tampere, Finland

**Bibliographical note**
ISBN kysytty, HO.
Ei ole, HO.
Research output: Professional › Conference contribution

Simulation of the Formation Process of Diesel Exhaust Particle Emissions

**General information**
State: Unpublished
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Research area: Aerosol Physics, Department of Physics, Research group: The Instrumentation, Emissions, and Atmospheric Aerosols Group
Publication date: 12 Mar 2014

**Host publication information**
Title of host publication: Physics Days 2014
Place of publication: Tampere, Finland
Publisher: Finnish Physical Society
ASJC Scopus subject areas: Pollution
Links:

**Bibliographical note**
abstract
Research output: Scientific - peer-review › Conference contribution

Aerosol Sampling and Transport

**General information**
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Physics, Research area: Optics, Research group: The Instrumentation, Emissions, and Atmospheric Aerosols Group, Research area: Aerosol Physics, Fortum Power and Heat Oy
Authors: Keskinen, J., Marjamäki, M.
Number of pages: 22
Pages: 63-84
Publication date: 2014

**Host publication information**
Title of host publication: Bioaerosol Detection Technologies : Part I
Place of publication: New York, NY
Publisher: Springer
Editors: Jonsson, P., Olofsson, G., Tjärnhage, T.
ISBN (Print): 978-1-4419-5582-1

**Publication series**
Name: Integrated Analytical Systems
ISSN (Print): 2196-4475
DOIs:
10.1007/978-1-4419-5582-1_5
Anisotropic total and effective stress stability analysis of the Perniö failure test

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Civil Engineering, Life Cycle Effectiveness of the Built Environment (LCE@BE)
Authors: D'Ignazio, M., Mansikkamäki, J., Länsivaara, T.
Number of pages: 6
Pages: 609-614
Publication date: 2014

Host publication information
Publisher: CRC Press Taylor & Francis Group; A Balkema book
Editors: Hicks, M. A. .., Brinkgreve, R. B. .. J. .., Rohe, A.
ISBN (Print): 978-1-138-00146-6
DOIs:
10.1201/b17017-109
Links:

Bibliographical note
Contribution: organisation=rak,FACT1=1<br/>Portfolio EDEND: 2014-12-31
Source: researchoutputwizard
Source-ID: 245
Research output: Scientific - peer-review › Conference contribution

ASROCKS-Hankkeen heikkouuttomenetelmien vertailu

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Civil Engineering
Authors: Tarvainen, T., Hatakka, T., Backman, B., Ketola, T., Härmä, P.
Number of pages: 13
Publication date: 2014

Publication information
Publisher: GEOLOGIAN TUTKIMUSKESKUS
Original language: Finnish
Links:

Bibliographical note
Contribution: organisation=rak,FACT1=1<br/>Portfolio EDEND: 2014-12-30
Source: researchoutputwizard
Source-ID: 1607
Research output: Professional › Commissioned report

Bearing Capacity and Assessment of Old Filler-Beam Bridge Decks

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Civil Engineering, Life Cycle Effectiveness of the Built Environment (LCE@BE)
Authors: Tulonen, J., Laaksonen, A.
Pages: 482-489
Publication date: 2014
Kiviainesten otto arseenialueilla - opas kiviainesten tuottajille, maarakentajille ja viranomaisille.

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Civil Engineering
Authors: Härmä, P., Tarvainen, T., Backman, B., Hatakka, T., Ketola, T., Kuula, P., Luoma, S., Pyy, O., Sorvari, J., Loukola-Ruskeeniemi, K.
Number of pages: 71
Publication date: 2014

Publication information
Place of publication: Espoo
Liikunta-alustan pystysuuntainen jäykkyys ja sen mitaaminen

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Civil Engineering
Authors: Jäniskangas, T.
Number of pages: 8
Pages: 85-92
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Liikunta ja Tiede
Volume: 51
Issue number: 6
ISSN (Print): 0358-7010
Ratings:
Publication Forum (2017): 1
Publication Forum (2016): 1
Publication Forum (2015): 1
Publication Forum (2014): 1
Publication Forum (2013): 1
Publication Forum (2012): 1
Original language: Finnish
Links:
http://www.lts.fi/sites/default/files/page_attachment/lt_6-14_tutkimusartikkelit_janiskangas_lowres.pdf

Bibliographical note
Contribution: organisation=rak,FACT1=1<br/>Portfolio EDEND: 2014-12-29<br/>Publisher name: Liikuntatieteellinen Seura ry
Source: researchoutputwizard
Source-ID: 570
Research output: Scientific - peer-review › Article

Sulfur Driven Nucleation in Diesel Exhaust: Simulations of a Laboratory Sampling System

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Research area: Aerosol Physics, Department of Physics
Authors: Olin, M. P., Dal Maso, M. I., Rönkkö, T. S.
Publication date: 2014

Host publication information
Title of host publication: 18th ETH-Conference on Combustion Generated Nanoparticles 2014
ASJC Scopus subject areas: Environmental Science (miscellaneous)
Links:
A source-orientated approach for estimating daytime concentrations of biogenic volatile organic compounds in an upper layer of a boreal forest canopy

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Lappalainen, H. K., Sevanto, S., Dal Maso, M., Taipale, R., Kajos, M., Kolari, P., Back, J.
Number of pages: 18
Pages: 127-144
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Boreal Environment Research
Volume: 18
Issue number: 2
ISSN (Print): 1239-6095
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.666 0.595
Publication Forum (2016): 1
Scopus rating (2015): 0.573 0.694
Web of Science (2015): 1.476 1.614 7.7 0.938 0.00219 0.58
Publication Forum (2015): 1
Scopus rating (2014): 0.519 0.75
Web of Science (2014): 1.481 2.022 6.7 0.938 0.00287 0.664
Publication Forum (2014): 2
Scopus rating (2013): 0.801 0.936
Publication Forum (2013): 2
Scopus rating (2012): 0.933 0.9
Publication Forum (2012): 2
Scopus rating (2011): 0.836 0.913
Scopus rating (2010): 0.656 0.784
Scopus rating (2009): 0.583 0.815
Scopus rating (2008): 1.004 0.842
Scopus rating (2007): 0.674 0.819
Scopus rating (2006): 0.533 0.736
Scopus rating (2005): 0.493 0.552
Scopus rating (2004): 0.537 0.681
Scopus rating (2003): 0.45 0.483
Scopus rating (2002): 0.378 0.512
Scopus rating (2001): 0.582 0.612
Scopus rating (2000): 0.344 0.633
Scopus rating (1999): 0.275 0.566
Original language: English
Links:
http://www.borenv.net/BER/pdfs/ber18/ber18-127.pdf

Bibliographical note
Julkaisutu muun organisaaion nimmisk (HY)<br/>Contribution: organisation=fys,FACT1=1<br/>Portfolio EDEND: 2013-10-29<br/>Publisher name: Suomen Ympäristökeskus
Source: researchoutputwizard
ASROCKS-hankkeen Action 1 vaiheen tutkimuskohteet

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Civil Engineering, Research group: Track Structures
Authors: Tarvainen, T., Kuula-Väisänen, P., Härmä, P.
Number of pages: 40
Publication date: 2013

Publication information
Place of publication: Espoo
Publisher: GEOLOGIAN TUTKIMUSKESKUS
Original language: Finnish

Publication series
Name: GTK:n arkistoraportit
Publisher: Geologian tutkimuskeskus
No.: 3

Bibliographical note
Contribution: organisation=rak,FACT1=1<br/>Portfolio EDEND: 2013-12-29
Source: researchoutputwizard
Source-ID: 3517
Research output: Professional › Commissioned report

ASROCKS project: Evaluation of arsenic concentrations in aggregate resources and construction sites in the Tampere-Häme region of Finland

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Civil Engineering, Research group: Track Structures
Authors: Härmä, P., Hatakka, T., Backman, B., Tarvainen, T., Loukola-Ruskeeniemi, K., Kuula-Väisänen, P., Pyy, O.
Number of pages: 3
Pages: 1799-1801
Publication date: 2013

Host publication Information
Title of host publication: Mineral deposit research for a high-tech world. Proceedings of the 12th Biennial SGA Meeting, 12-15 August 2013, Uppsala, Sweden
Publisher: Society for Geology Applied to Mineral Deposits
Editor: Jonsson, E.
ISBN (Print): 978-91-7403-207-9

Publication series
Name: Biennial Meeting of the Society for Geology Applied to Mineral Deposits
Volume: 4
Links:
http://www.e-sga.org

Bibliographical note
Contribution: organisation=rak,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: Society for Geology Applied to Mineral Deposits
Source: researchoutputwizard
Source-ID: 2242
Research output: Scientific › Conference contribution

Näytteiden otto geokemiallisia analyysejä ja liukosuustestejä varten kalliokivienkäteen sekä soran ja hiekan tuotantoalueilla ja rakennuskohteissa luontaisesti korkeiden arseenipitoisuuksien alueilla
Gas phase formation of extremely oxidized pinene reaction products in chamber and ambient air

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Urban circular bioeconomy (UrCirBio), Former organisation of the author
Pages: 5113-5127
Publication date: 2012
Peer-reviewed: Yes

Journal: Atmospheric Chemistry and Physics
Volume: 12
Issue number: 11
ISSN (Print): 1680-7316
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 3.264 1.756
Publication Forum (2016): 3
Scopus rating (2015): 3.308 1.531
Web of Science (2015): 5.114 5.626 4.9 1.184 0.09839 1.719
Scopus rating (2014): 3.482 1.698
Web of Science (2014): 5.053 5.656 4.5 0.925 0.10405 1.822
Publication Forum (2014): 3
Scopus rating (2013): 3.784 1.854
Publication Forum (2013): 3
Scopus rating (2012): 3.882 1.583
Publication Forum (2012): 3
Scopus rating (2011): 3.279 1.489
Scopus rating (2010): 3.395 1.516
Scopus rating (2009): 3.673 1.6
Scopus rating (2008): 3.408 1.544
Measurement of the nucleation of atmospheric aerosol particles

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Urban circular bioeconomy (UrCirBio)
Pages: 1651-1667
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Nature Protocols
Volume: 7
Issue number: 9
ISSN (Print): 1754-2189
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 9.413 3.273
Publication Forum (2016): 1
Scopus rating (2015): 8.892 3.014
Publication Forum (2015): 1
Scopus rating (2014): 7.059 2.662
Publication Forum (2014): 2
Scopus rating (2013): 6.182 2.602
Publication Forum (2013): 2
Scopus rating (2012): 7.767 3.579
Publication Forum (2012): 2
Scopus rating (2011): 7.21 3.314
Scopus rating (2010): 5.822 2.558
Scopus rating (2009): 4.298 1.895
Scopus rating (2008): 2.882 1.344
Scopus rating (2007): 1.065 0.459
Original language: English
DOIs:
10.1038/nprot.2012.091

Bibliographical note
Contribution: organisation=fys,FACT1=1
Portfolio EDEND: 2013-11-29
Publisher name: Nature Publishing Group