Colloge of Atmospheric Physics,
Nanjing University of Information Science and Technology

Emission characteristic of particulate matter from various sources and related application

Shaofei Kong doctor/lector

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2013-01-04

Contents

Self-introduction

Previous works

Opportunities

Self-introduction

Shaofei Kong，1986,2, **Interests in** :Source apportionment of atmospheric particulate matter usi receptor models; design of dilution systems for combustion sources; emission characteristic of pollutants from combustion sources; emission factors and emission inventory for toxic and hazardou components; risk assessment for toxic and hazardous components in fugitive dust; marine aerosol.

Lectuer, June 2012-Now. CMA Key Laboratory for Atmospheric Physics and Environment, Colloge of Atmospheric Physics, Nanjing University of Information Science and Technology, Nanjing 210044, China

Ph.D., 09/2007-06/2012. Environmental Science, **Nankai University**, Tianjin, China (free of postgraduate examination) (Ph.D. Thesis “Study on The Chemical Composition, Risk Assessment and Emission Inventory Establishment for Hazardous Components in Particulate Matter from Atmospheric Pollution Sources”, Nankai University, June, 2012 ; Advisors: Zhipeng Bai;)

B.S.,09/2003-06/2007. Environmental Engineering, **University of Mining and Technology,** Xuzhou, China

Summarize for previous works

Till now：

- **Projects**: Main participant for 12 items， Principle Investigator for 3 items;
- **Thirty-one** peer-reviewed publications， including 20 SCI papers, 11 as the first author;
- Peer-reviewed **conference papers** and abstracts as 13;
- **Submitted English manuscripts** as 6, 3 as the first author;
- **Reviewers**: Fuel Processing Technology, Journal of Hazardous Materials, Acta Geodynamica et Geomaterialia, Journal of Environmental Monitoring;
- **Honors**: Nine honors in Bachelor and 21 honors in Master/Doctor

Previous works

- **Profiles characteristic of particulate matter from various sources**

- Emission factors for heavy metals, PAHs and carbonic species in PM

- Emission inventories for heavy metals, PAHs and carbonic species in PM

- Source apportionment for PM

Source monitoring

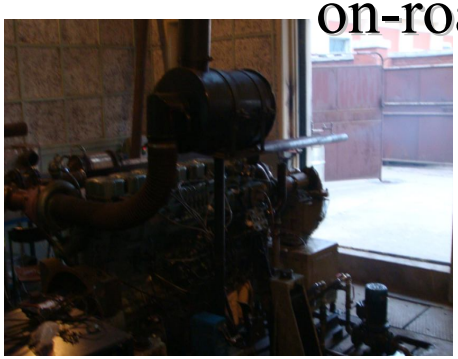
(1) Fugitive dust

(2) Stationary sources

(3) Vehicle emission

Engine test

on-road test



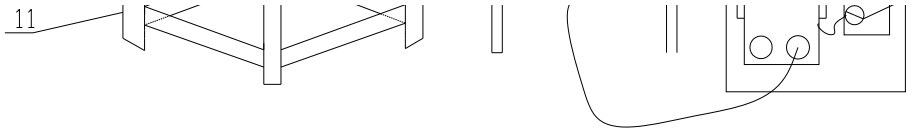
(4) Domestic burning

Fugitive dust-resuspension chember

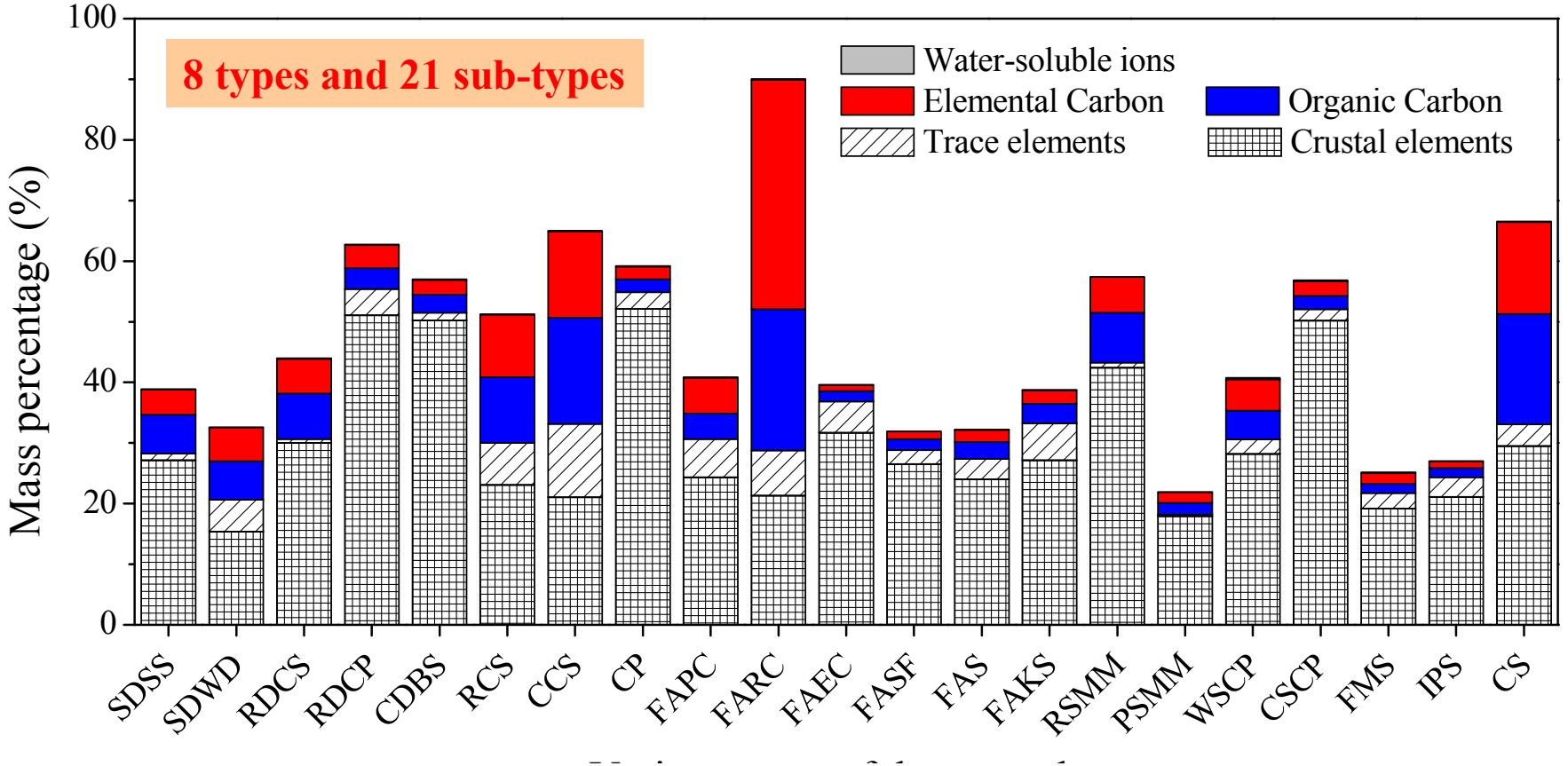
Table 4
Source profiles of PM_{10}-bound PAHs in the eight types ashes (mass percentage, %).

	BCCPS	BCBEP	BIBEP	SHBEP	NPASH	ACCPS	ACSEP	ACBEP
NaP	3.19 ± 0.73	0.73 ± 0.13	0.18 ± 0.05	1.82 ± 0.32	2.48 ± 0.67	1.20 ± 1.02	0.41 ± 0.05	1.00 ± 0.13
Ace	0.62 ± 0.10	0.32 ± 0.01	0.15 ± 0.21	0.36 ± 0.05	0.41 ± 0.05	0.30 ± 0.12	1.75 ± 0.02	1.99 ± 0.36
Acy	0.53 ± 0.09	0.11 ± 0.04	0.03 ± 0.01	0.16 ± 0.03	0.23 ± 0.03	0.23 ± 0.18	0.10 ± 0.01	0.16 ± 0.02
Fl	1.80\±0.42	0.73 ± 0.30	0.18 ± 0.13	0.86 ± 0.17	1.15 ± 0.15	0.62 ± 0.36	1.12 ± 0.04	1.18 ± 0.17
Phe	9.50 ± 1.44	7.15 ± 0.89	2.05 ± 1.07	8.33 ± 1.90	10.51 ± 0.97	5.93 ± 2.03	10.52 ± 0.28	10.52 ± 1.29
Ant	13.46 ± 2.08	9.95 ± 1.23	2.92 ± 1.54	11.61 ± 2.64	14.76 ± 1.43	8.36 ± 2.90	2.38 ± 0.14	2.46 ± 0.32
Flu	11.67 ± 0.60	14.24 ± 0.61	16.49 ± 1.23	14.30 ± 0.57	14.94 ± 1.06	12.81 ± 0.96	16.28 ± 0.32	16.35 ± 1.46
Pyr	7.16 ± 0.24	10.34 ± 0.27	7.25 ± 0.39	10.16 ± 0.40	9.46 ± 0.69	7.86 ± 0.75	12.24 ± 0.22	12.60 ± 1.15
BaA	5.53 ± 2.97	4.71 ± 0.11	10.27 ± 5.47	8.34 ± 3.96	9.14 ± 0.57	6.33 ± 2.61	6.76 ± 0.03	6.86 ± 0.06
Chr	6.24 ± 1.00	6.39 ± 0.03	14.93 ± 2.34	6.38 ± 0.28	6.01 ± 0.47	7.57 ± 1.26	4.65 ± 0.40	5.08 ± 0.14
BbF	13.71 ± 0.61	13.04 ± 0.43	22.83 ± 2.89	11.61 ± 0.47	8.93 ± 2.71	15.92 ± 2.61	11.13 ± 0.28	11.31 ± 0.62
BkF	7.43 ± 2.60	6.80 ± 2.48	5.71 ± 0.81	7.39 ± 0.30	4.48 ± 2.15	8.54 ± 3.78	4.75 ± 1.87	3.32 ± 0.36
BaP	5.74 ± 1.71	6.68 ± 0.29	5.42 ± 6.17	5.01 ± 0.45	4.38 ± 0.43	5.59 ± 0.50	8.10 ± 0.44	7.82 ± 0.88
IND	7.72 ± 3.25	10.10 ± 1.05	6.83 ± 0.67	7.25 ± 0.54	6.88 ± 1.03	10.40 ± 0.85	11.57 ± 0.46	10.79 ± 2.01
DBA	1.10 ± 0.00	0.88 ± 0.07	1.09 ± 0.13	0.76 ± 0.06	0.66 ± 0.15	1.10 ± 0.06	0.48 ± 0.17	0.78 ± 0.14
BghiP	4.69 ± 1.49	5.69 ± 0.39	3.05 ± 0.26	4.44 ± 0.36	4.24 ± 0.44	5.84 ± 1.00	5.68 ± 0.21	5.64 ± 0.71
COR	0.97 ± 0.55	2.13 ± 0.21	0.62 ± 0.20	1.47 ± 0.17	1.55 ± 0.26	1.38 ± 0.46	2.08 ± 0.23	2.13 ± 0.39

Mean ± Standard deviation was listed.



(Kong et al., Atmospheric Environment, 2011, 45: 3777-3785



Mass percentages for carbon abundances in fugitive dust

Source types	Mass percentages	Source types	Mass percentages
soil dust	10.5%-12.0%	coal storage pile	21.1%-31.8%
road dust	7.3%-13.2%	cement	4.3%
construction dust	5.4%	coal fly ash	10.1%-61.1%
iron smelt	4.1%-9.4%	industrial raw material and production	2.7%-33.63%

S. Kong et al. / Atmospheric Environment 45 (2011) 5351-5365

Journal of Environmental Monitoring

Dynamic Article Links

Cite this: *J. Environ. Monit.*, 2012, **14**, 791

www.rsc.org/jem

PAPER

Risk assessment of heavy metals in road and soil dusts within $PM_{2.5}$, PM_{10} and PM_{100} fractions in Dongying city, Shandong Province, China

Shaofei Kong,[ab] **Bing Lu,**[ab] **Yaqin Ji,**[ab] **Xueyan Zhao,**[ab] **Zhipeng Bai,**[*abc] **Yonghai Xu**[d] **Yong Liu**[d] **and Hua Jiang**[d]

Received 9th July 2011, Accepted 28th October 2011
DOI: 10.1039/c1em10555h

Size distribution of heavy metals and human health risk assessment in road and soil dust

Atmospheric Environment 45 (2011) 4192–4204

Contents lists available at ScienceDirect

Atmospheric Environment

journal homepage: www.elsevier.com/locate/atmosenv

ELSEVIER

Potential threat of heavy metals in re-suspended dusts on building surfaces in oilfield city

Shaofei Kong [a,b], Bing Lu [a,b], Zhipeng Bai [a,b,c], Xueyan Zhao [a,b], Li Chen [a,b], Bin Han [a,b], Zhiyong Li [a,b], Yaqin Ji [a,b,*], Yonghai Xu [d], Yong Liu [d], Hua Jiang [d]

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[d] Dongying Environmental Monitoring Center, Dongying, Shandong Province, China

Size distribution of heavy metals and human health risk assessment in road and resuspended dust

Microchemical Journal 98 (2011) 280–290

Contents lists available at ScienceDirect

Microchemical Journal

journal homepage: www.elsevier.com/locate/microc

Levels, risk assessment and sources of PM_{10} fraction heavy metals in four types dust from a coal-based city

Shaofei Kong, Bing Lu, Yaqin Ji, Xueyan Zhao, Li Chen, Zhiyong Li, Bin Han, Zhipeng Bai *

State Environmental Protection Key Laboratory of Urban Ambient Air Particulate Matter Pollution Prevention and Contr
College of Environmental Science and Engineering, Nankai University, Weijin Road 94#, Tianjin, China

Contents, sources and risk assessment of heavy metals in four types of fugitive dust

Environmental Pollution 170 (2012) 161–168

Contents lists available at SciVerse ScienceDirect

Environmental Pollution

journal homepage: www.elsevier.com/locate/envpol

Diversities of phthalate esters in suburban agricultural soils and wasteland soil appeared with urbanization in China

Shaofei Kong [a,b], Yaqin Ji [a,b,*], Lingling Liu [a,b], Li Chen [a,b], Xueyan Zhao [a,b], Jiajun Wang [a,b], Zhipeng Bai [a,b], Zengrong Sun [c]

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[b] *State Environmental Protection Key Laboratory of Urban Ambient Air Particulate Matter Pollution Prevention and*
[c] *School of Public Health, Tianjin Medical University, Qixiangtai Road 22, Tianjin 300070, China*

PAEs in soils and source analysis

Atmospheric Environment 55 (2012) 7–16

Contents lists available at SciVerse ScienceDirect

Atmospheric Environment

journal homepage: www.elsevier.com/locate/atmosenv

Distribution and sources of polycyclic aromatic hydrocarbons in size-differentiated re-suspended dust on building surfaces in an oilfield city, China

Shaofei Kong [a,b], Bing Lu [a,b], Yaqin Ji [a,b], Zhipeng Bai [a,b,c,*], Yonghai Xu [d], Yong Liu [d], Hua Jiang [d]

[a] State Environmental Protection Key Laboratory of Urban Ambient Air Particulate Matter Pollution Prevention and Control, Nankai University, Weijin Road 94#, Tianjin 300071, China
[b] College of Environmental Science and Engineering, Nankai University, Weijin Road 94#, Tianjin, China
[c] Chinese Research Academy of Environmental Sciences, Beijing 100012, China
[d] Dongying Environmental Monitoring Center, Dongying, Shandong Province, China

Contents and sources of PAHs in RDB

Chemosphere 85 (2011) 494–501

Contents lists available at SciVerse ScienceDirect

Chemosphere

journal homepage: www.elsevier.com/locate/chemosphere

Concentrations, spatial distributions and congener profiles of polychlorinated biphenyls in soils from a coastal city – Tianjin, China

Zhiyong Li [a,b], Shaofei Kong [a,b], Li Chen [a,b], Zhipeng Bai [a,b,*], Yaqin Ji [a,b], Jinwei Liu [c], Bing Lu [a,b], Bin Han [a,b], Qianwen Wang [a,b]

[a] College of Environmental Science and Engineering, Nankai University, Tianjin 300071, PR China
[b] State Environmental Protection Key Laboratory of Urban Ambient Air Particulate Matter Pollution Prevention and Control, Tia
[c] Central Laboratory of Geology and Mineral Resources of Hebei Province, Baoding 071003, PR China

Contents and sources of PCBs in soils

Source monitoring

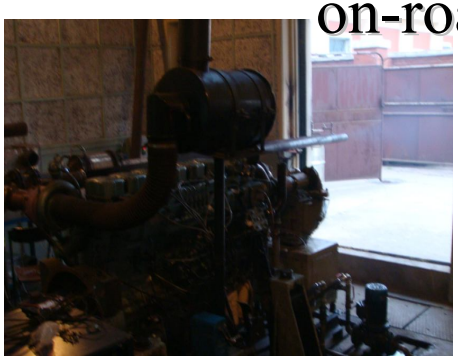
(1) Fugitive dust

(2) Stationary sources

(3) Vehicle emission

Engine test

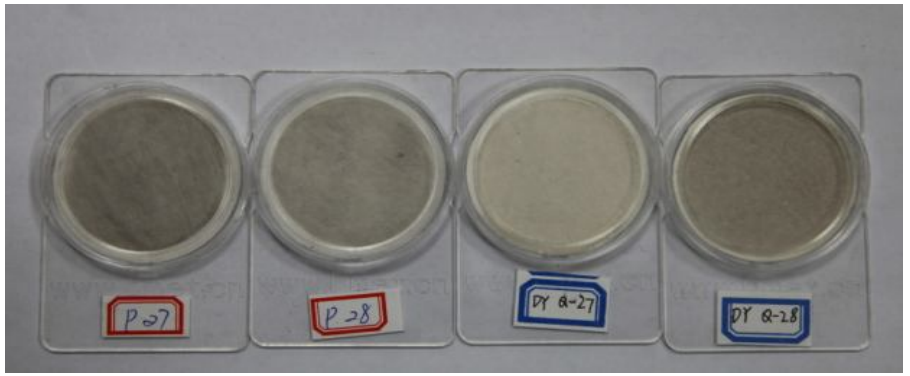
on-road test



(4) Domestic burning

Stationary sources

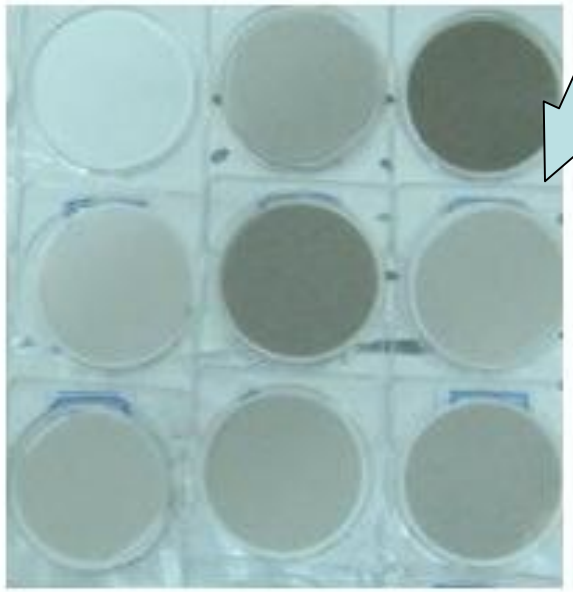
dilution sampling system



Source sampling

Feb-Mar, 2010
11 sites

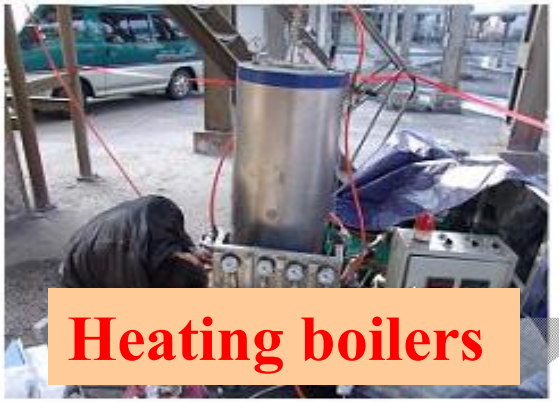
Sampling time: 8-23 h



Coal power plant

Heating boilers

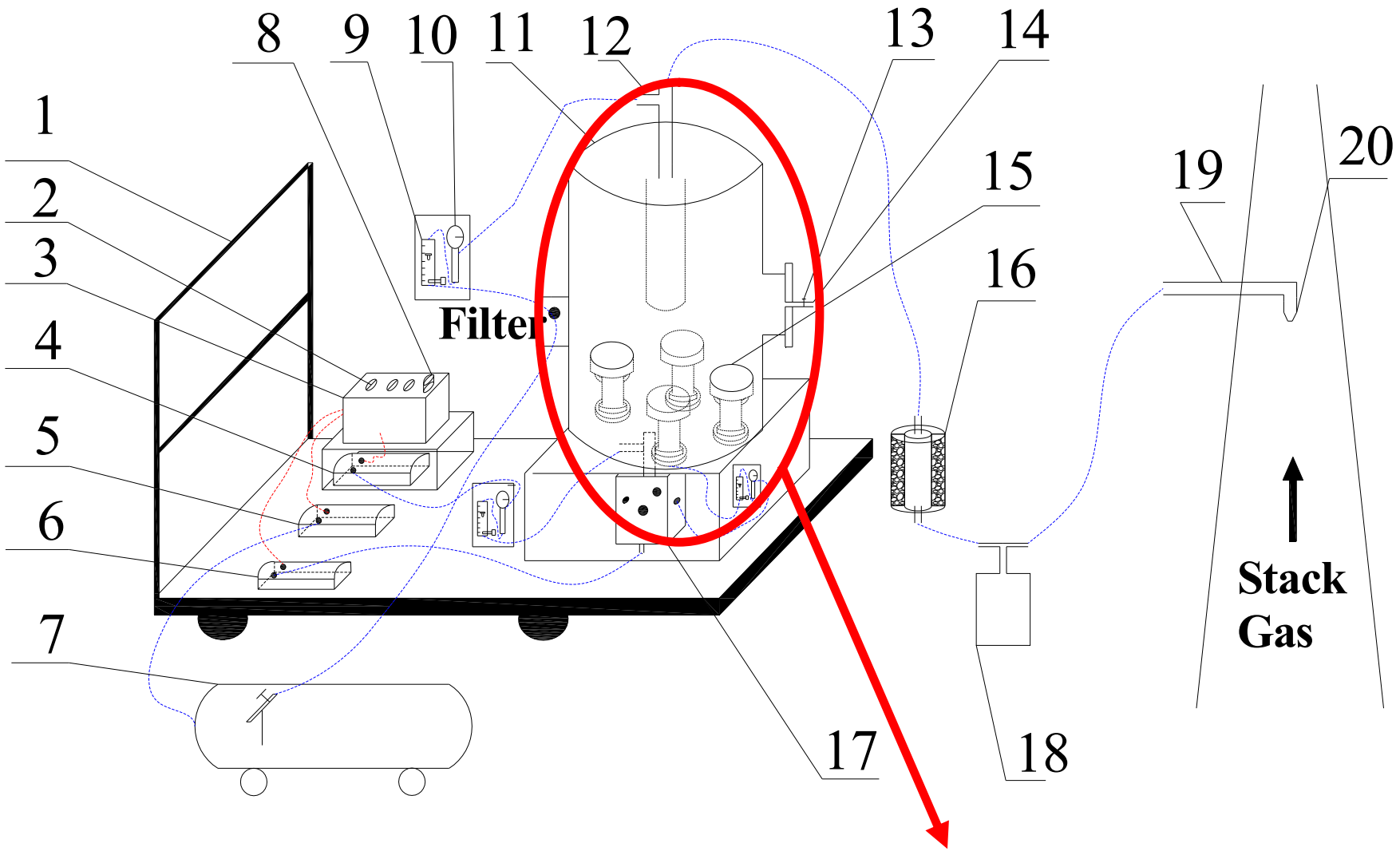
Sinter



Heating boilers

Coal power plant

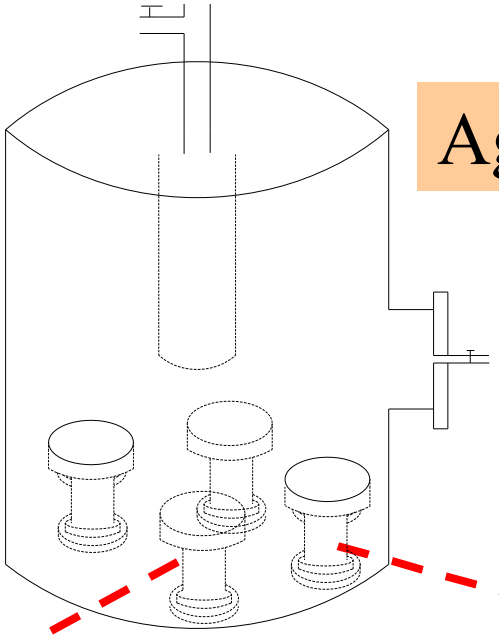
Coal power plant

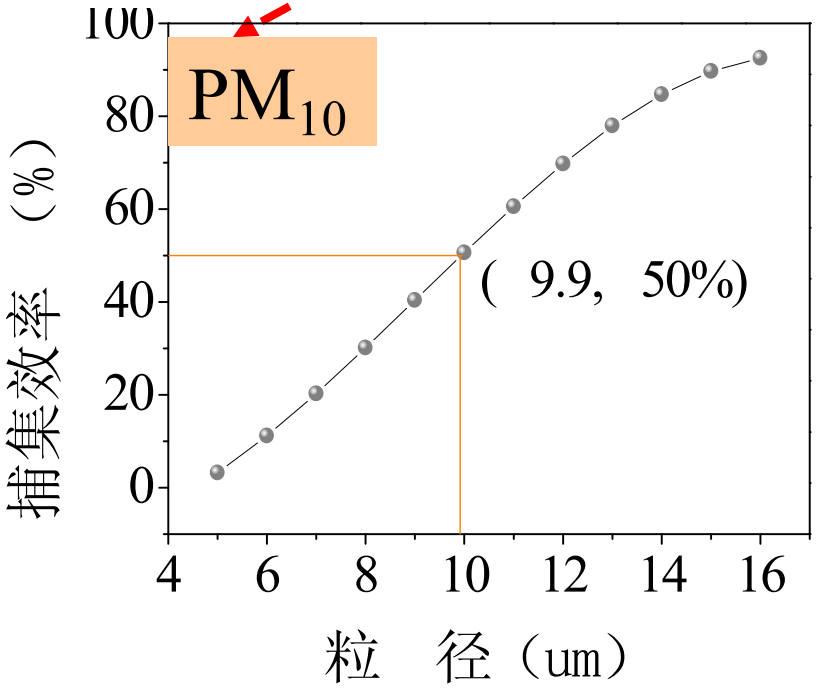


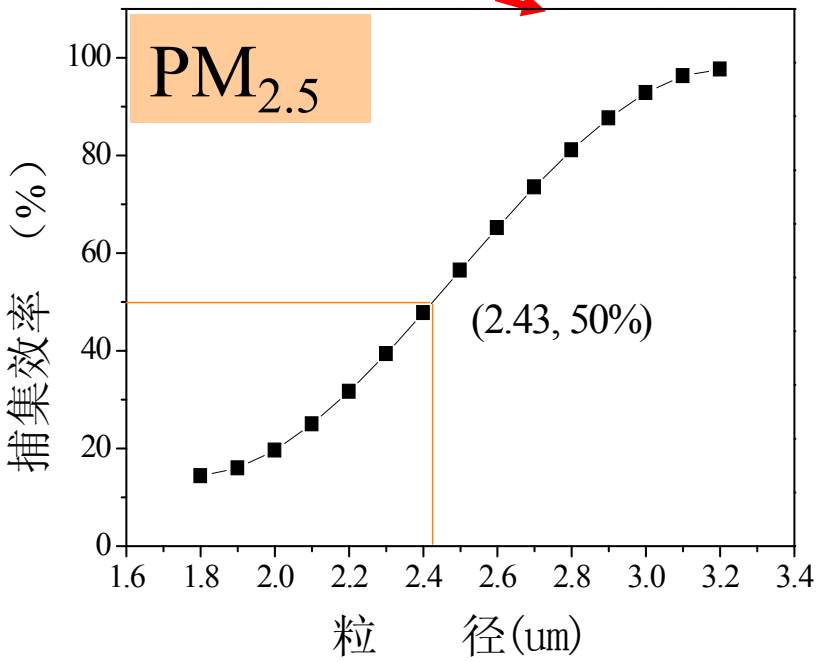
Aging chamber

Structure for dilution sampling system

Aging chamber







第36卷第11期 煤 炭 学 报 Vol. 36 No. 11
2011年 11月 JOURNAL OF CHINA COAL SOCIETY Nov. 2011

Source profile of TSP and PM_{10} from coal-fired boilers

LU Bing[1,2], KONG Shao-fei[1,2], HAN Bin[1,2], LI Zhi-yong[1,2], BAI Zhi-peng[1,2]

(1. *State Environmental Protection Key Laboratory of Urban Ambient Air Particulate Matter Pollution and Control, Tianjin 300071, China*; 2. *College of Environmental Science and Engineering, Nankai University, Tianjin 300071, China*)

第34卷 第12期 环境科学与技术 Vol. 34 No.12
2011年12月 Environmental Science & Technology Dec. 2011

Progress on Sampling Methods for Particulate Matter from Stationary Sources

KONG Shao-fei[1,2], BAI Zhi-peng[1,2*], LU Bing[1,2],
HAN Bin[1,2], GUO Guang-huan[1,2]

(1.School of Environment Science and Engineering, Nankai University;
2.State Environmental Protection Key Laboratory of Urban Air Particulate Pollution and Control, Tianjin 300071, China)

Source monitoring

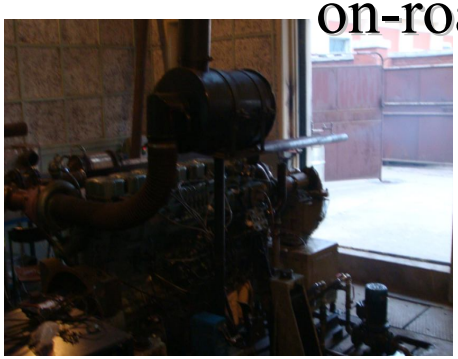
(1) Fugitive dust

(2) Stationary sources

(3) Vehicle emission

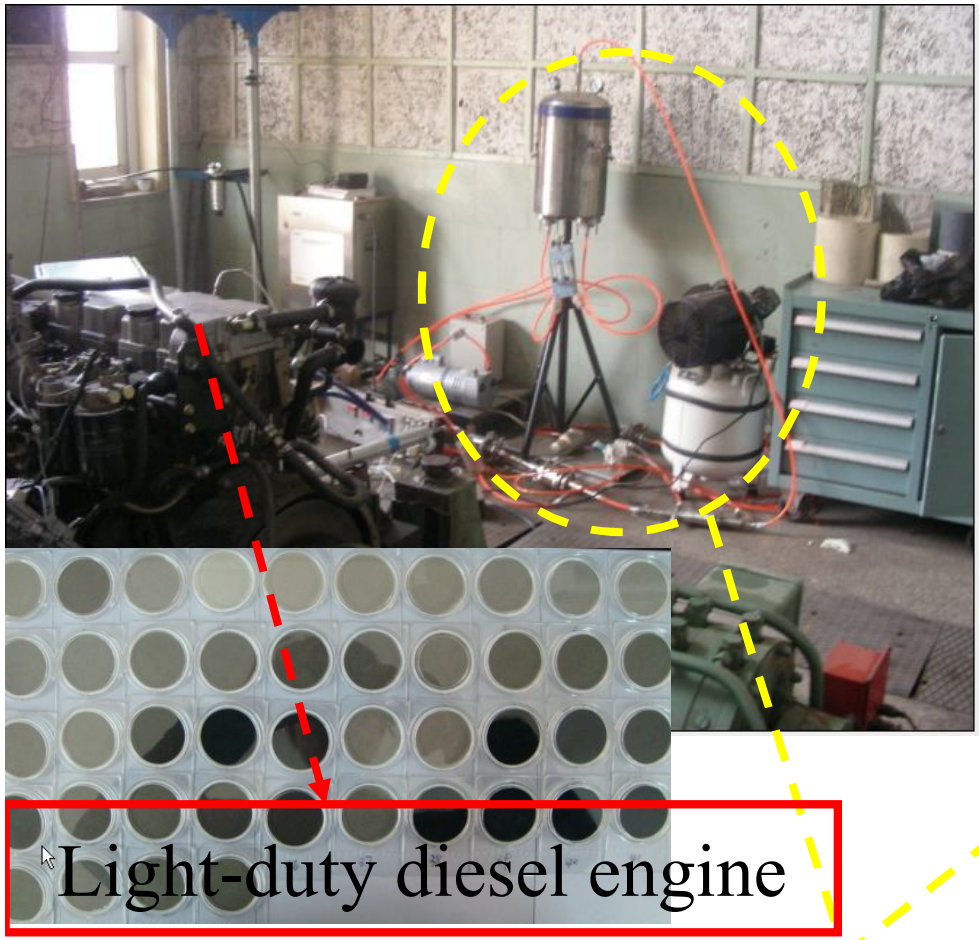
Engine test

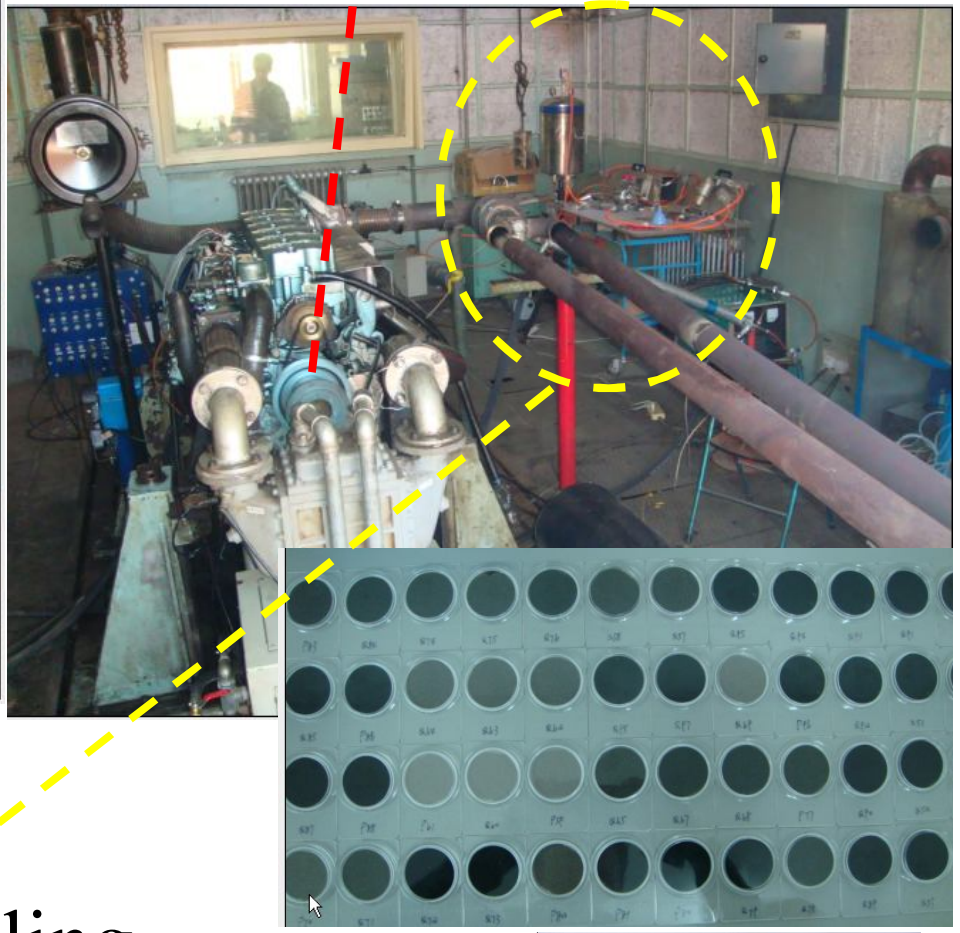
on-road test

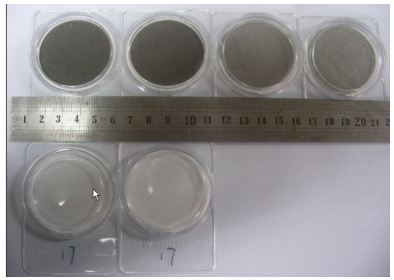


(4) Domestic burning

Vehicle emissions







Two stage dilution sampling system for combustion sources

Structure diagram for the two stage dilution sampling system of PM key lab used in engine test

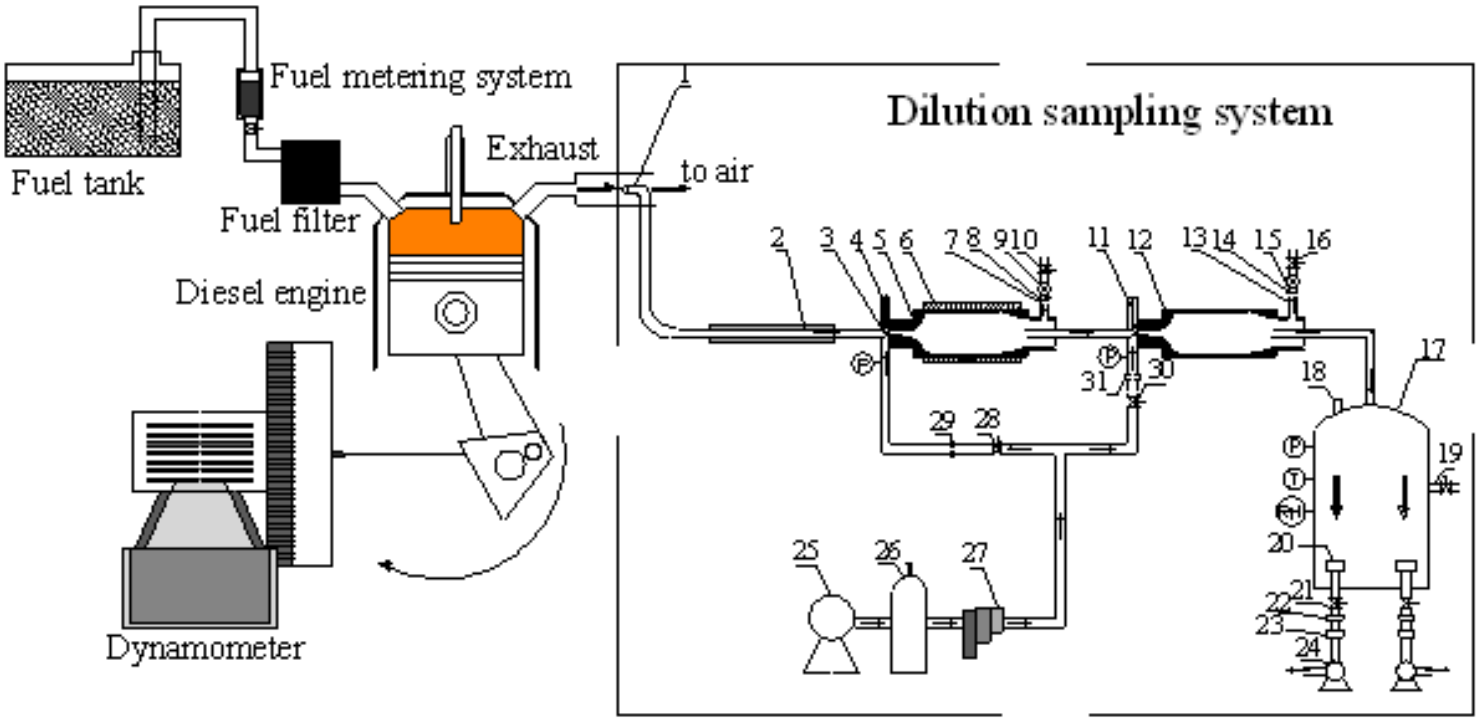
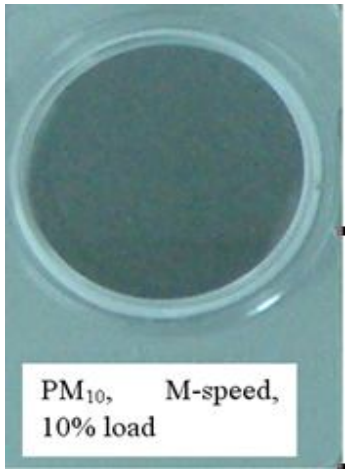
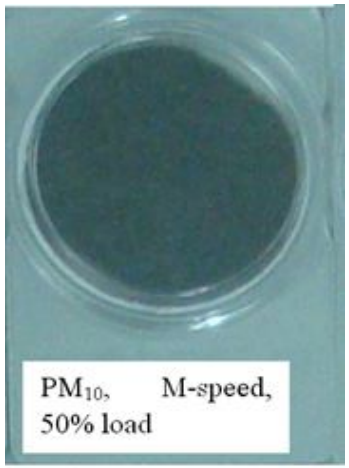


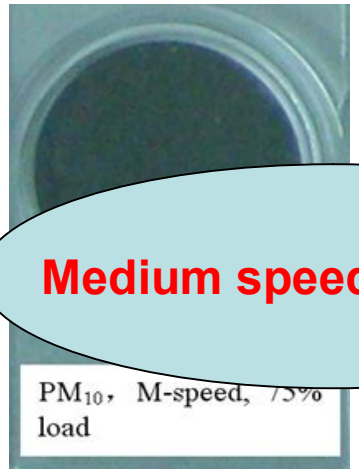
Fig.1 shows a schematic diagram for the engine, dilution system and sampling system.
1 Nozzle; 2. sampling probe; 3.inject nozzle; 4. thermometer; 5. the first stage diluter; 6. heating coat; 7. filter; 8. flowmeter; 9. thermometer; 10. flow control valve; 11. thermometer; 12. the second stage diluter; 13. filter; 14. thermometer; 15. flowmeter; 16. flow control valve; 17. aging chamber; 18. pressure meter; 19. gas monitoring hole; 20. dust cap; 21. flow control valve; 22. filter; 23. flowmeter; 24. pump; 25. air compressor; 26. gas storage tank; 27. filters; 28. flow control valve; 29. thermometer; 30. flow control valve; 31. thermometer.

Low speed, 700r/min

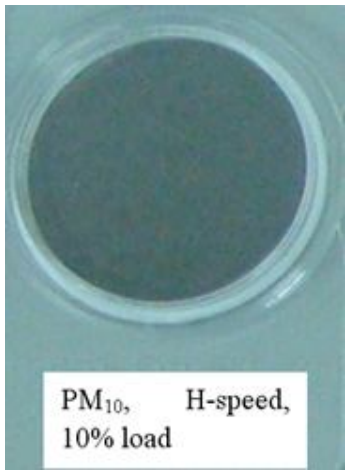
Filters obtained From light-duty diesel engine

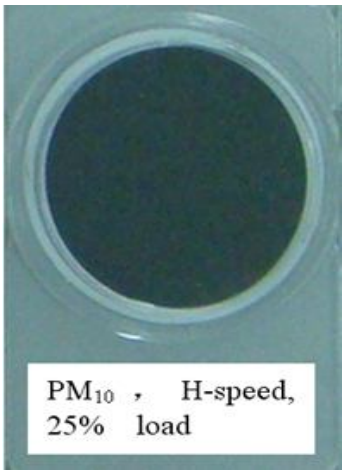


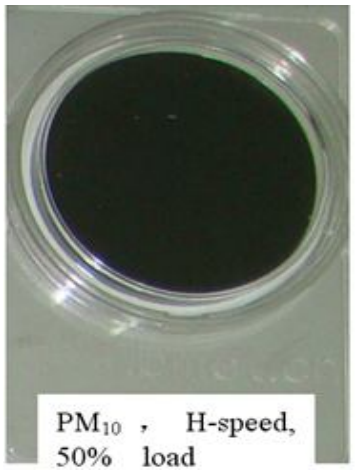


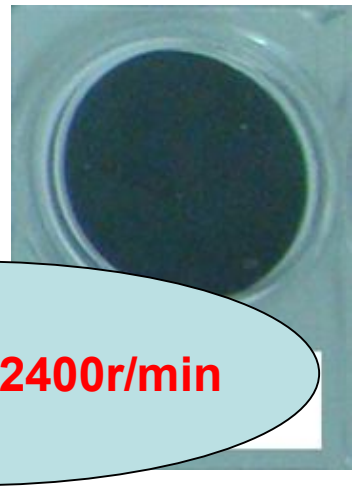


Medium speed, 1800r/min



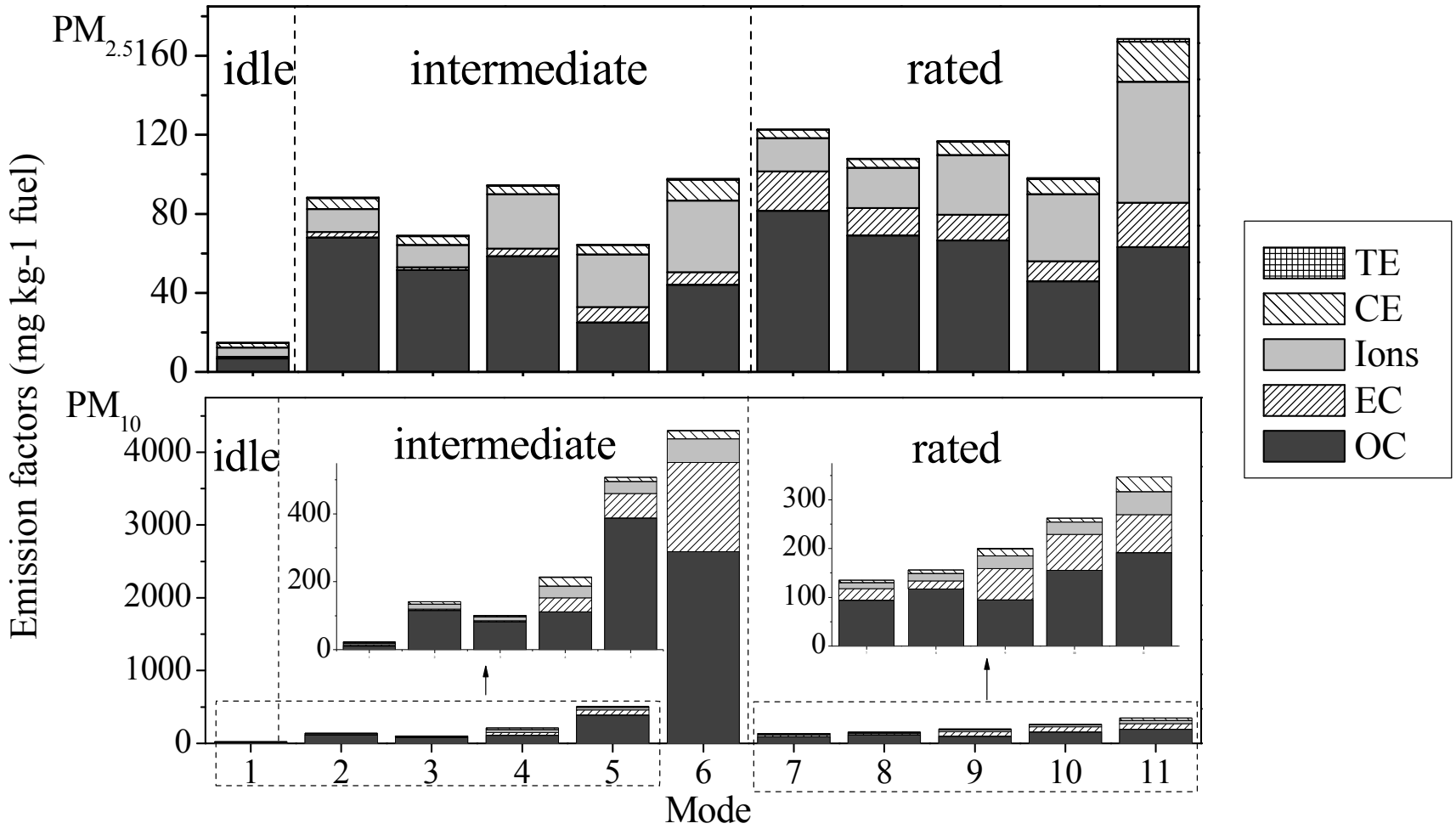






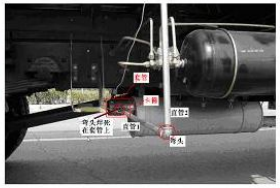
High speed, 2400r/min

Fuel-based emission factors

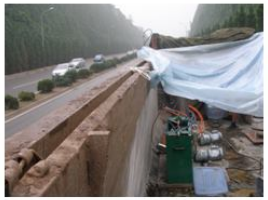


Under review by Fuel

Real-road test


Tianjin



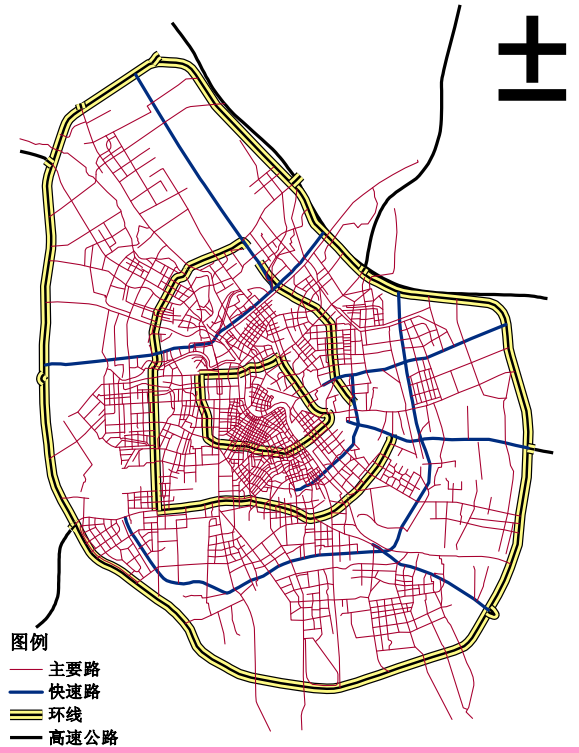


Jinan

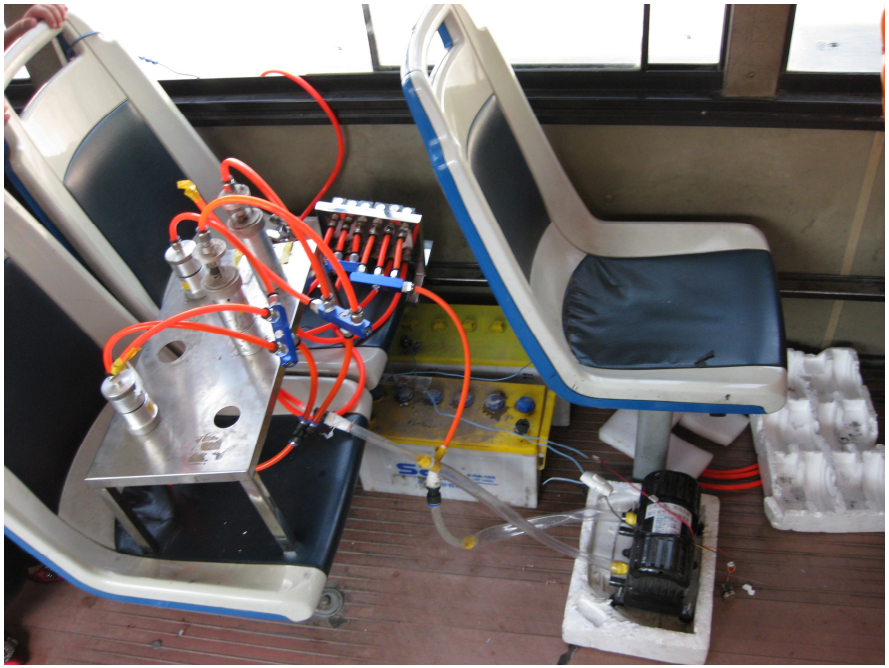
Xining




On-road test on the outer ring of Tianjin



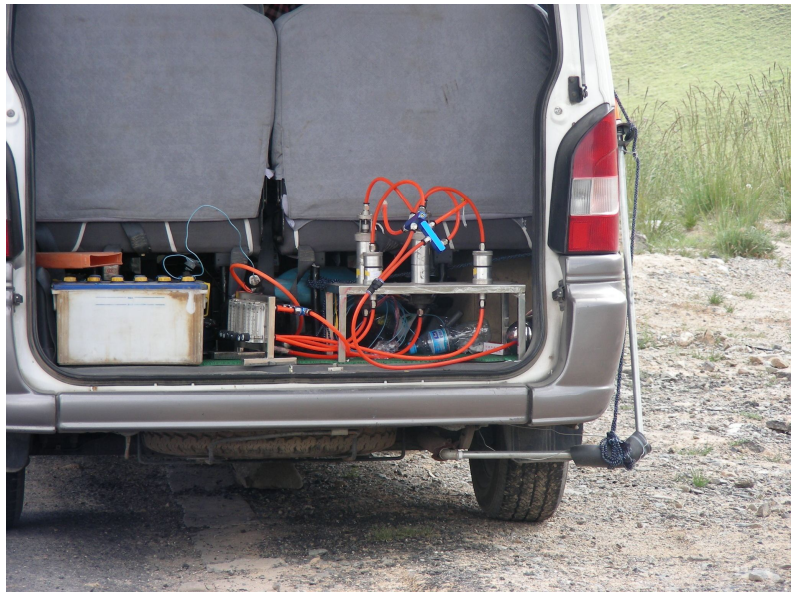
Utilization of the two-stage dilution sampling system for on-road diesel truck emission in Tianjin

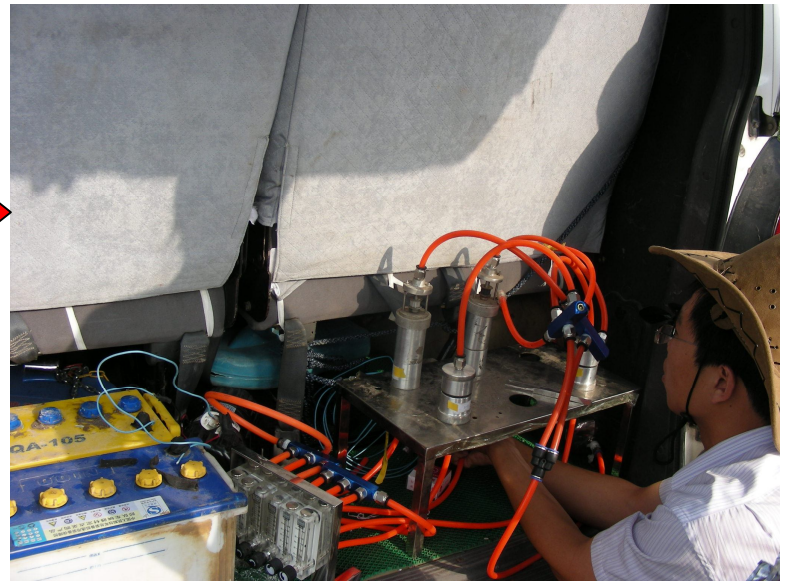


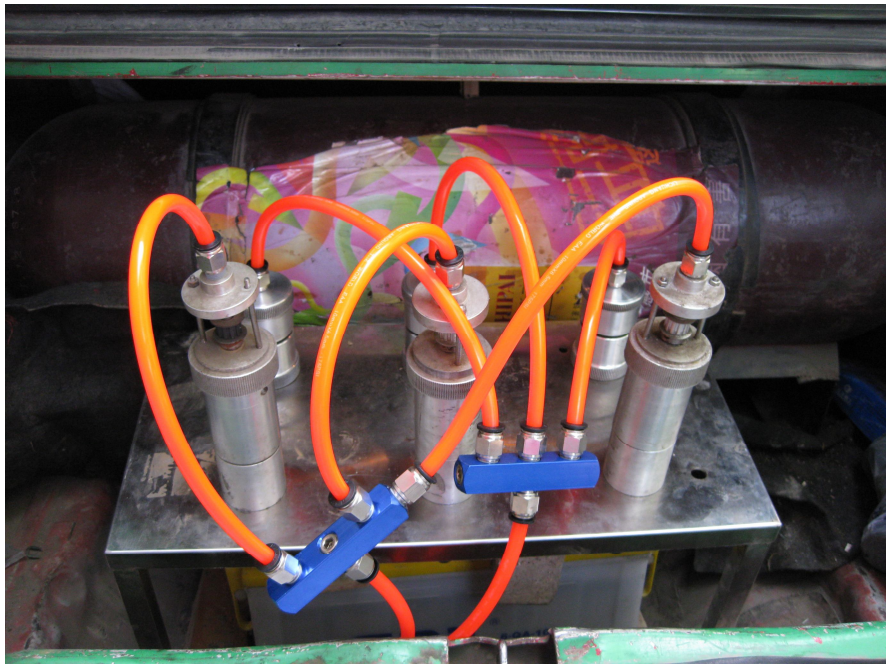
A portable sampling system designed by PM key lab used for on-road test on bus emission

On-road vehicle emission sampling

A portable sampling system designed by PM key lab used for on-road test on a small passenger car







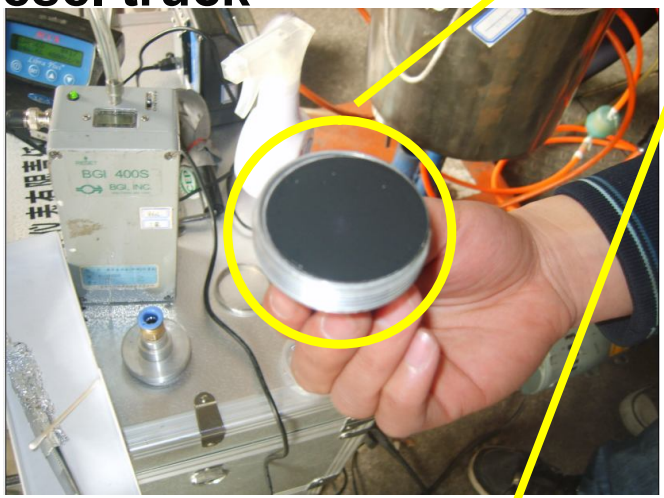
A portable sampling system designed by PM key lab used for on-road test on taxi emission

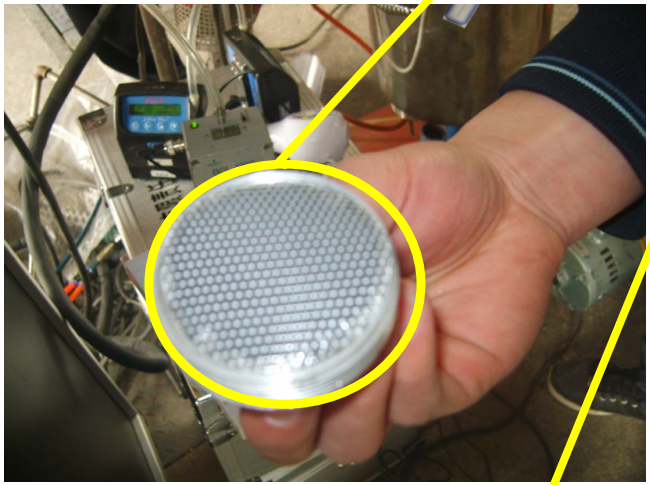
Utilization of the two-stage dilution sampling system for on-road diesel truck emission in Xining

Heavy diesel truck

Quartz filter

Teflon filter





Light diesel truck

采用Teflon滤膜用于分析元素；石英滤膜用于分析离子和碳组分

第18届中国大气环境科学与技术大会
—中国环境科学学会大气环境分会2011年学术年会

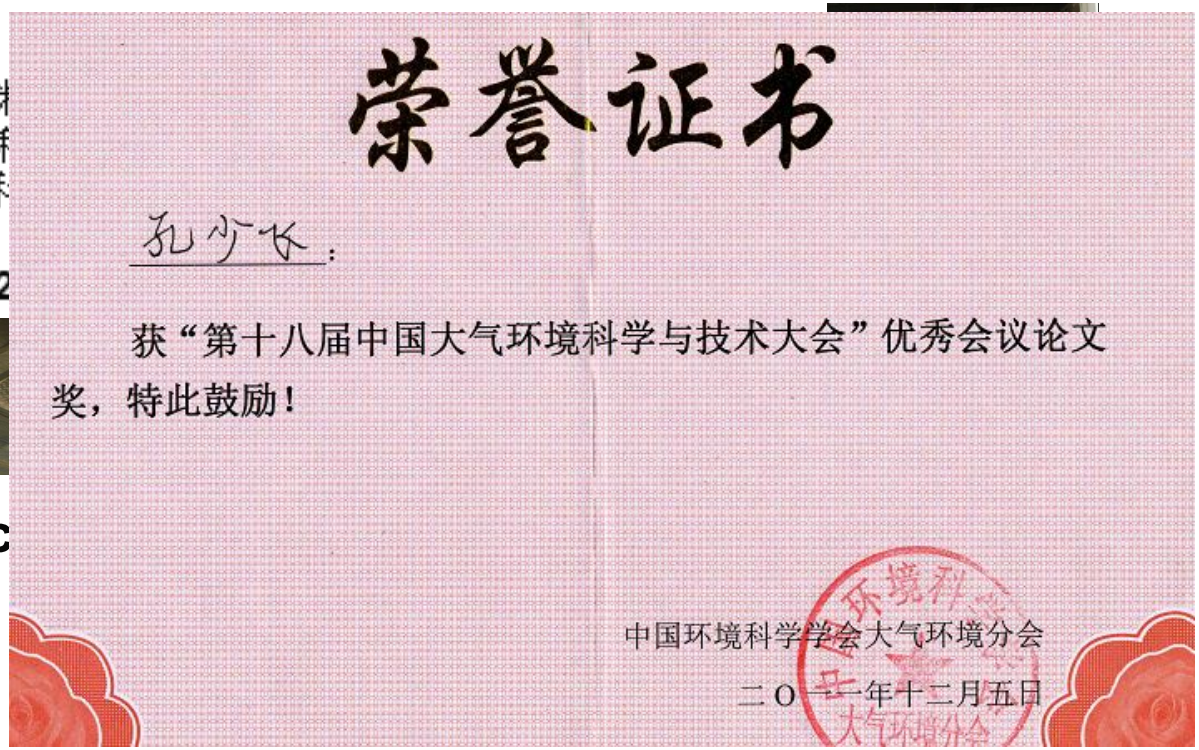
北京机动车尾气排放PM_{10}成分谱特征研究

孔少飞[1,2]，耿春梅[3]，李彭辉[1,2]，陆 炳[1,2]，赵若杰[1,2]，孙如峰[1,2]，白志鹏[1,2,3]*

1. 国家环境保护城市空气颗
2. 南开大学环境
3. 中国环境

Heavy gasoline c

l truck



PM10 source profiles for vehicles

ARTICLE IN PRESS

Aerosol and Air Quality Research, x: 1–11, xxxx

ISSN: 1680-8584 print / 2071-1409 online
doi: 10.4209/aaqr.2012.04.0087

Assessing Hazardous Risks of Vehicle Inspection Workers' Exposure to Particulate Heavy Metals in Their Work Place

Peng-Hui Li[1], Shao-Fei Kong[1], Chun-Mei Geng[2], Bin Han[1,3*], Bing Lu[1], Ru-Feng Sun[1], Ruo-Jie Zhao[1], Zhi-Peng Bai[1,2]

[1] *College of Environmental Science and Engineering, Nankai University, Tianjin, China*
[2] *Chinese Research Academy of Environmental Sciences, Beijing, China*
[3] *College of Mathematics Science, Nankai University, Tianjin, China*

Source monitoring

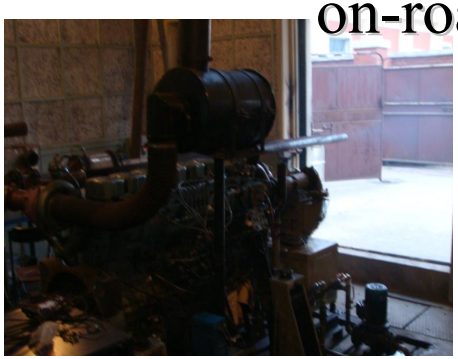
(1) Fugitive dust

(2) Stationary sources

(3) Vehicle emission

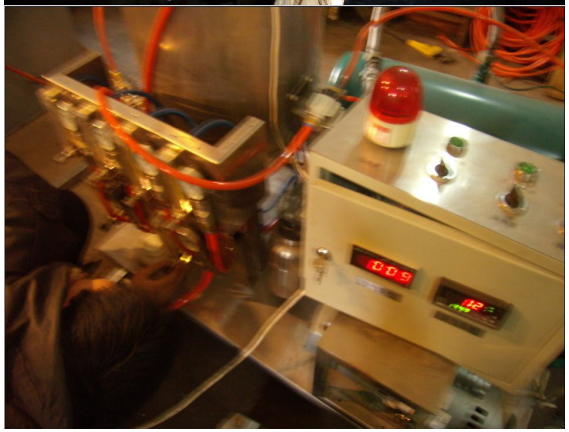
Engine test

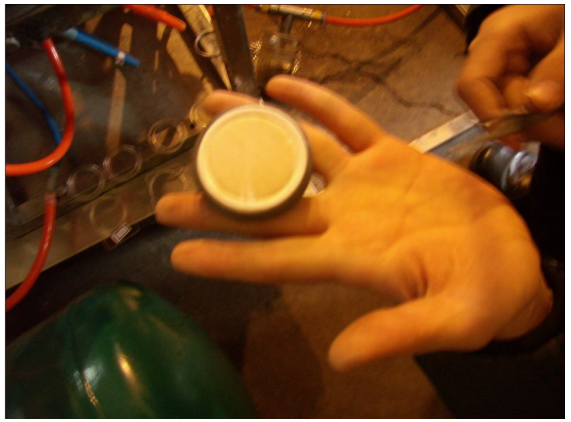
on-road test

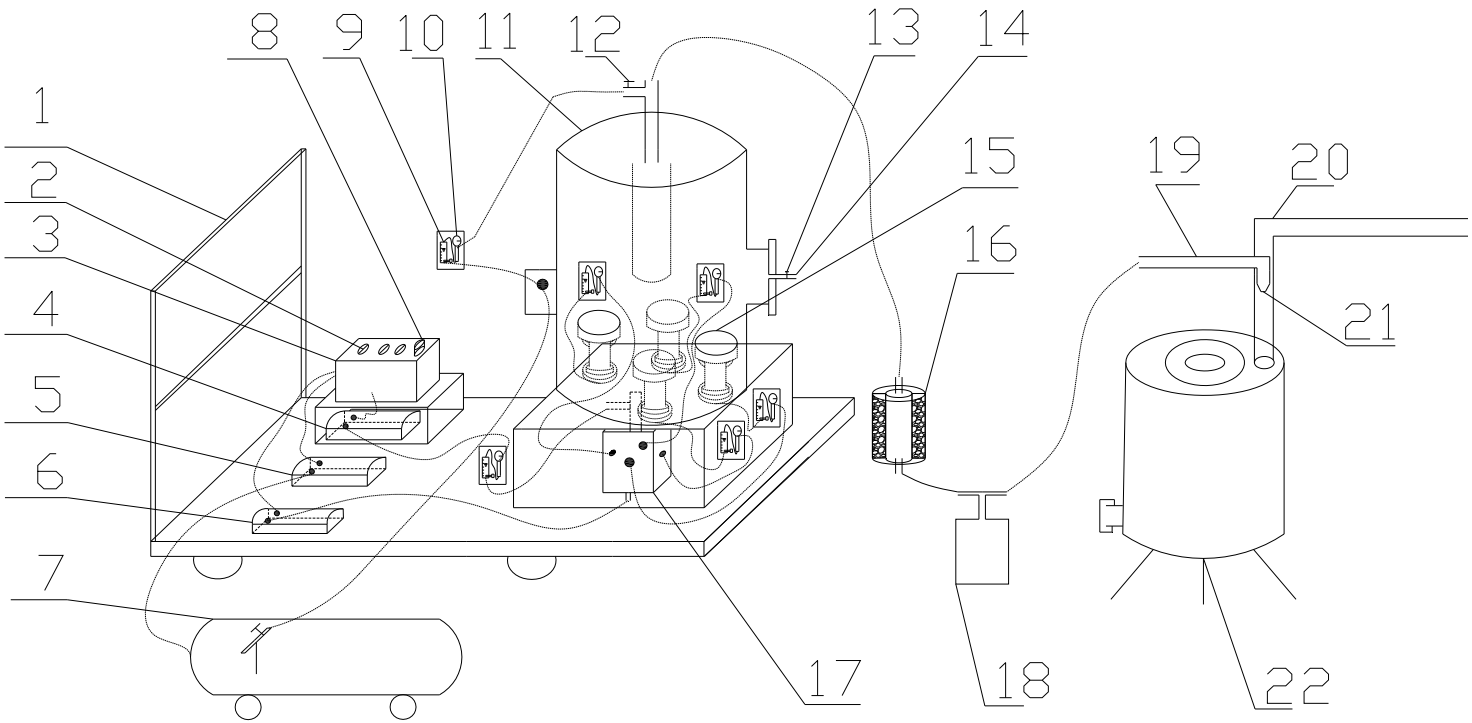


(4) Domestic burning

Domestic fuel: Straw, honeycomb coal, raw coal, wood







Dilution sampling system used for domestic coal combustion of research group

Previous works

- Profiles characteristic of particulate matter from various sources

- **Emission factors for heavy metals, PAHs and carbonic species in PM**

- Emission inventories for heavy metals, PAHs and carbonic species in PM

- Source apportionment for PM

Previous works

- Profiles characteristic of particulate matter from various sources
- Emission factors for heavy metals, PAHs and carbonic species in PM
- **Emission inventories for heavy metals, PAHs and carbonic species in PM**
- Source apportionment for PM

Emission inventories for hazardous materials in PM2.5 of straw combustion in 2009

有害组分排放量=相应排放因子×玉米产量×谷草比×燃烧比例×燃烧效率

中国环境科学 2011,31(2): 186~194 China Environmental Science

全国总排放量（吨）

2007 年中国大陆地区生物质燃烧排放污染物清单

陆 炳,孔少飞,韩 斌,王秀艳,白志鹏* (南开大学环境科学与工程学院,国家环境保护城市空气颗粒物污染防治重点实验室,天津 300071)

Inventory of atmospheric pollutants discharged from biomass burning in China continent in 2007. LU Bing, KONG Shao-fei, HAN Bin, WANG Xiu-yan, BAI Zhi-peng* (State Environmental Protection Key Laboratory of Urban Ambient Air Particulate Matter Pollution and Control, College of Environmental Science and Engineering, Nankai University, Tianjin 300071, China). *China Environmental Science*, 2011,31(2): 186~194

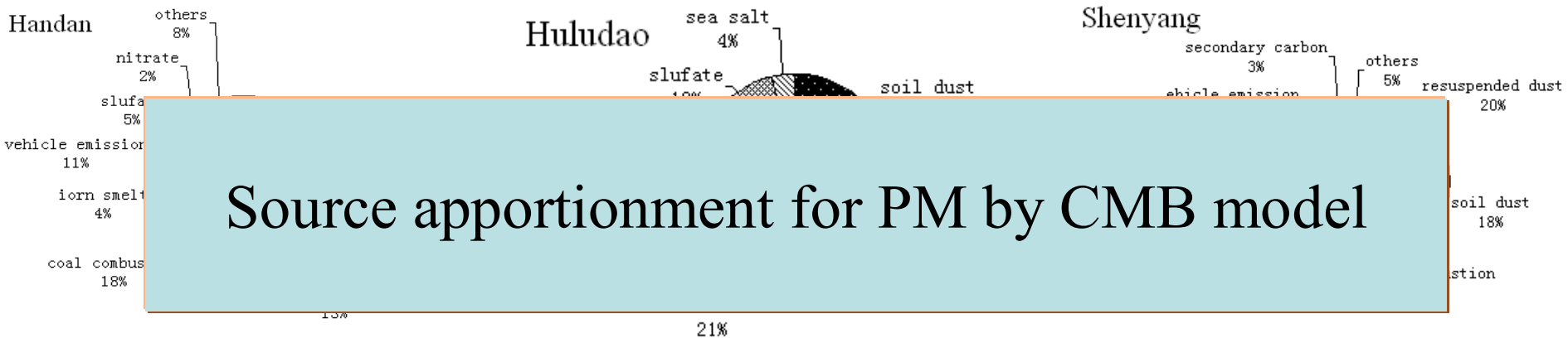
Abstract: In the present work, the total amounts of CH_4, SO_2, NO_x, NH_3, EC, OC, NMVOC, CO, CO_2, TSP, PM_{10}, $PM_{2.5}$discharged from biomass burning in Chinese continent region were calculated with biomass consumption combined with emission factors. Spatial distribution of the pollutants and mass contribution of each type of biomass combustion were given. In general , in the year 2007 , the total emissions of CH_4, SO_2, NO_x, NH_3, EC, OC, NMVOC, CO, CO_2, TSP, PM_{10}, $PM_{2.5}$was 3332.7, 335.3, 951.3, 7754.9, 783.7, 267.7, 6049.6, 76579.6, 743743.7, 7677.8, 6668.9, 4043.7kt, respectively. Sichuan, Anhui, Guangxi, Shandong, Henan and Jiangsu held high emission amounts while in Beijing, Tianjin, Hainan, Ningxia, Qinghai and Tibet, the pollutants amount was low. Straw and firewood burning were main emission sources, which share 93.8%~98.7% of the total emission. The main substances emitting pollutants differed in different regions as well as the emission intensity per unit area and per capita.

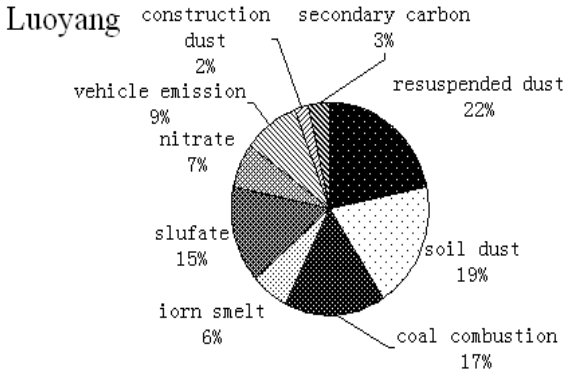
Key words: biomass; emission inventory; open burning; pollutant

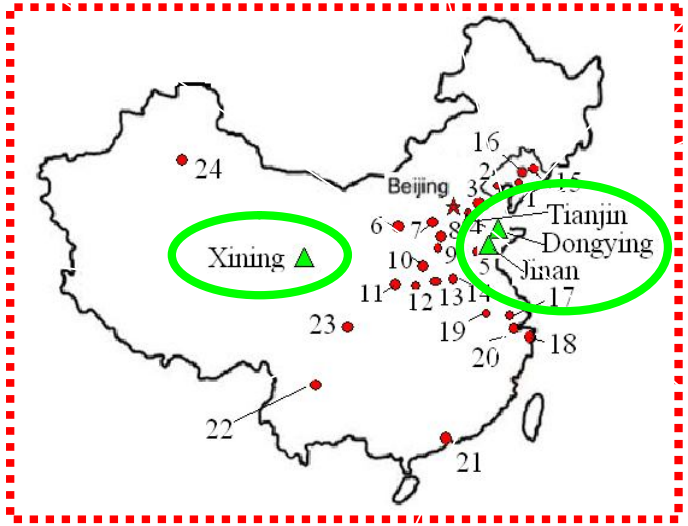
Previous works

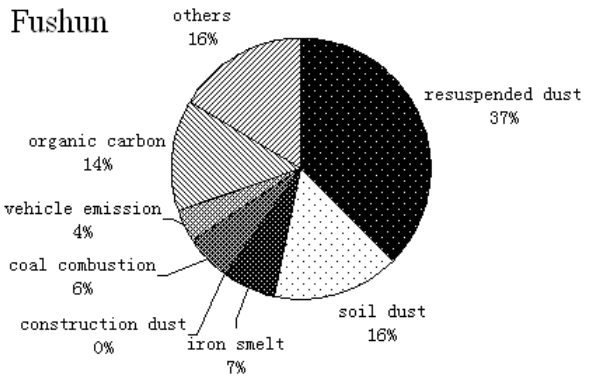
- Profiles characteristic of particulate matter from various sources
- Emission factors for heavy metals, PAHs and carbonic species in PM
- Emission inventories for heavy metals, PAHs and carbonic species in PM
- **Source apportionment for PM**

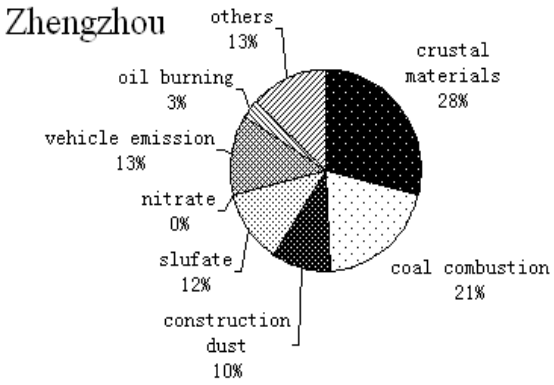
Source apportionment for PM by CMB model

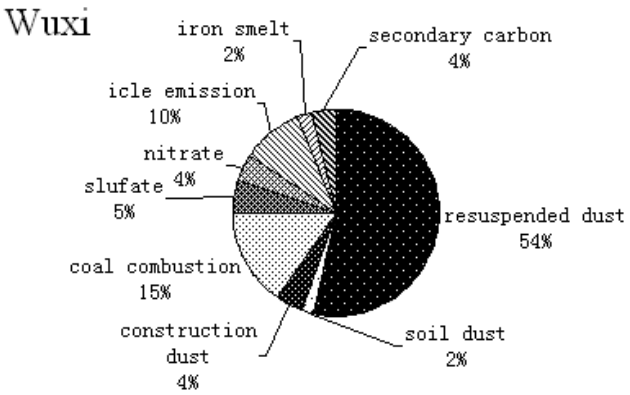


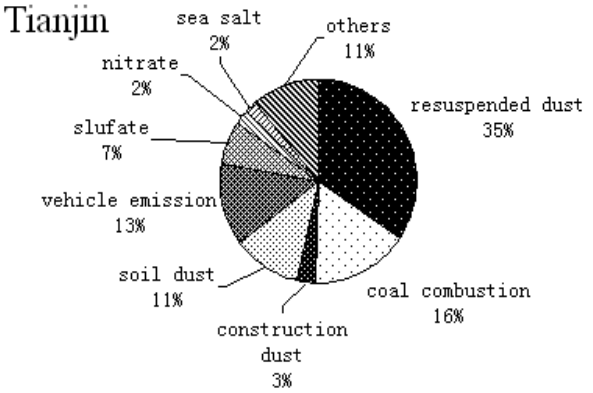












Science of the Total Environment 408 (2010) 4681–4694

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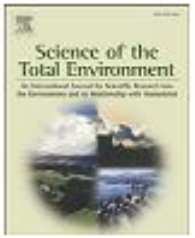

Receptor modeling of $PM_{2.5}$, PM_{10} and TSP in different seasons and long-range transport analysis at a coastal site of Tianjin, China

Shaofei Kong [a,b], Bin Han [a,b], Zhipeng Bai [a,b,*], Li Chen [a,b], Jianwu Shi [a,b], Zhun Xu [a,b]

[a] College of Environmental Science and Engineering, Nankai University, Tianjin, 300071, PR China
[b] State Environmental Protection Key Laboratory of Urban Ambient Air Particulate Matter Pollution Prevention and Control, Tianjin, 300071, PR China

PCA and CMB used for source apportionment of atmospheric TSP、PM10 and PM2.5

Back-trajectory analysis

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Self-introduction

Previous works

Opportunities

SCIENCE CHINA
Earth Sciences

• RESEARCH PAPER •

August 2010 Vol.53 No.8: 1205–1215
doi: 10.1007/s11430-010-3065-5

Seasonal variation analysis of atmospheric CH_4, N_2O and CO_2 in Tianjin offshore area

KONG ShaoFei, LU Bing, HAN Bin, BAI ZhiPeng*, XU Zhun, YOU Yan, JIN LiangMao, GUO XiaoYang & WANG Rui

State Environmental Protection Key Laboratory of Urban Ambient Air Particulate Matter Pollution Prevention and Control,

A high spatial resolution emission inventories for greenhouse gases based on field-test emission factors

	ment				
	biomass buring	7%–13%			
Sink	atmosphere oxidation in troposphere	88%–98%	ocean adsorption	25%	continental ecosystem photosynthesis
	stratosphere transportation	2%–12%	soil adsorption		ocean adsorption
	dry soil adsorption	5.4%	atmosphere oxidation in troposphere		aggradation in continental and ocean ecosystem (organic or inorganic carbon)

a) After refs. [7, 8, 12, 13, 32–39]. *, the ratio of ocean source to the whole CH_4 sources, the others are ratios of each single source to the natural or anthropogenic sources; **, the percentages were calculated according to ref. [8].

Thank you for your attention

Shaofei Kong

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