SUPPLEMENTAL INFORMATION TO ARTICLE:

SORPTION OF ORGANIC VAPORS TO DIESEL SOOT AND ROAD TUNNEL AEROSOLS

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1. Experimental Details

Gas flow rates of 2 and 40 ml/min for diesel soot experiments correspond to a linear velocity of 6 to 100 cm/min, and between 2 and 18 ml/min for the road tunnel experiments to a linear velocity of 5 to 45 cm/min. The pressure drop within the packed columns for the mentioned flow was 40 to 620 Pa, with total pressures at the column inlet between 50 and 650 Pa above ambient pressure, for the diesel soot/glass beads mixture. For the road tunnel aerosols the pressure drop was 40 to 250 Pa, with total pressures at the column inlet between 50 and 300 Pa above ambient pressure.

2. Assymetries of Peaks

Peak asymmetries were calculated by the ratio of the peak center ($t_{peak\ center}$) to the maximum of the peak ($t_{peak\ maximum}$). In our experiments, they were higher than in previous work with inorganic surfaces (*1-3*). Possible reasons for asymmetries are turbulence due to irregular packing or a dead volume, sorption in the non-linear range of the isotherm, or kinetically limited sorption (*4*). On average, the assymetries were 1.4 ± 0.2 for the diesel soot and 1.2 ± 0.1 for the road tunnel aerosols. Asymmetries of inert tracer peaks were significantly lower on both samples (methane: 1.01 to 1.04, fluoroalkanes on diesel soot: 1.12 ± 0.05). For a discussion of kinetic limitation and non-linearity see article.

3. Adsorption to Dimethyl-Silanized Glass Beads

Dimethyl-silanized glass beads (DMCS-treated, Alltech, 125-150 μm, used as received) were used in diesel soot experiments. Adsorption to these glass beads was measured for 60 compounds at 50% RH (Table S1). For 21 compounds, measurements were also conducted at 90% RH. No influence of the relative humidity could be observed. Therefore, measurements for two compounds (2-nitrotoluene and n-pentylbenzene) at 90% RH were included in the data set in Table S1, as data at 50% RH was not available. The total data set was evaluated with our adsorption equation (*1*) (n=62, $R^2 = 0.92$, at 15°C):

$$\begin{aligned}\log K_{i\ glass beads/air}\left(\mathrm{m^3/g}\right) = {} & 0.135\left(\pm 0.003\right)\times 5.56\left(\pm 0.22\right)\times \log K_{i\ hexadecane/air} \\ & + 5.11\left(\pm 0.15\right)\times 0.39\left(\pm 0.03\right)\times \Sigma\beta_i \\ & + 3.60\left(\pm 0.28\right)\times 0.57\left(\pm 0.05\right)\times \Sigma\alpha_i \\ & - 9.22\left(\pm 0.14\right)\end{aligned} \qquad \text{(S1)}$$

$\log K_{i\ glass\ beads/air}$ are given in (m^3/g), for the compound parameters see text of article or (*1*). Note that the adsorption coefficients are normalized by the weight of the sample, not by the surface area of the glass beads, as would normally be done when adsorption occurs. This is due to the very low specific surface area $SSA_{glass\ beads}$ (~0.032 m^2/g), which cannot be measured exactly with the BET-apparatus used here (Brunauer-Emmet-Teller nitrogen adsorption method). To avoid this uncertainty, we apply the adsorption model to the weight-normalized adsorption coefficients with a fitted constant instead of the theoretical constant (-8.47). The surface parameters then cannot readily be compared with those of other surfaces. Eq. (S1) is reported for practical reasons and is valid for these glass beads with a radius of 125-150 μm, and was used to subtract the possible maximum adsorption to glass beads in the glass beads-soot mixture. Note, that from the difference of the fitted constant (-9.22) and the theoretical constant (-8.47) the $SSA_{glass\ beads}$ can be estimated ($SSA_{glass\ beads} = 10^{(8.47-9.22)}$) and should be about 0.18 m^2/g.

TABLE S1: Adsorption coefficients measured for 62 compounds on glass beads (125-150 μm), at 15°C, mostly 50% RH, except for 2-nitrotoluene and n-pentylbenzene (90% RH). Corresponding compound parameters are taken from refs. (*5-8*).

Compound	$\log K_{i\ glass\ beads/air}$ (m^3/g)	$\Sigma\alpha_i$	$\Sigma\beta_i$	$\log K_{i\ hexadecane/air}$ (m^3/m^3)
1-Cyanopropane/Butanenitrile	-6.12	0	0.36	2.548
Non-1-ene	-6.06	0	0.07	4.073
1,1,1-Trichloroethane	-6.94	0	0.09	2.733
1,2-Dichlorobenzene	-5.50	0	0.04	4.518
1,2,4-Trimethylbenzene	-5.62	0	0.19	4.441
1,3-Dichlorobenzene	-5.63	0	0.02	4.41
1,3,5-Trimethylbenzene	-5.72	0	0.19	4.344
1,4-Dichlorobenzene	-5.65	0	0.02	4.435
2,2,2-Trifluoroethanol	-6.60	0.57	0.25	1.224
2-Methylpropan-2-ol	-5.78	0.31	0.6	1.963
3-Methylbutan-1-ol	-5.17	0.37	0.48	3.011
3-Methylbutan-2-one	-6.23	0	0.51	2.692
4-Methylpentan-2-one	-5.87	0	0.51	3.089
2-Propanone	-6.66	0.04	0.51	1.696
Aniline	-4.74	0.26	0.41	3.934
Methyl phenyl ether/Anisole	-5.86	0	0.29	3.89
Benzaldehyde	-5.48	0	0.39	4.008
Benzonitrile	-5.12	0	0.33	4.039
Bromobenzene	-6.13	0	0.09	4.041
1-Bromopentane	-6.46	0	0.12	3.611
Butan-1-ol	-5.53	0.37	0.48	2.601
2-Butanone	-6.51	0	0.51	2.287
Butyraldehyde	-6.26	0	0.45	2.27
2-Chloroaniline	-4.64	0.25	0.31	4.674
Chlorobenzene	-6.28	0	0.07	3.657
1-Chloroheptane	-5.76	0	0.1	4.282
1-Chlorohexane	-6.27	0	0.1	3.777
Cyclohexanone	-5.19	0	0.56	3.792
Cyclooctane	-6.11	0	0	4.329
Cyclopentanol	-5.20	0.32	0.56	3.241
Cyclopentanone	-5.47	0	0.52	3.221
n-Decane	-5.54	0	0	4.686
Di-n-butyl ether	-5.75	0	0.45	3.924
1,4-Dioxane	-6.07	0	0.64	2.892
Ethanol	-6.22	0.37	0.48	1.485
Ethylbenzene	-6.30	0	0.15	3.778
Ethyl acetate	-6.57	0	0.45	2.314
Hexan-1-ol	-4.90	0.37	0.48	3.61

TABLE S1: continued

Compound	log $K_{i\ glass\ beads/air}$ (m^3/g)	$\Sigma\alpha_i$	$\Sigma\beta_i$	log $K_{i\ hexadecane/air}$ (m^3/m^3)
Indane	-5.61	0	0.17	4.59
Iodobenzene	-5.56	0	0.12	4.502
Isobutyl acetate	-5.80	0	0.47	3.161
Methyl acetate	-6.93	0	0.45	1.911
Methyl benzoate	-4.78	0	0.48	4.704
1-Methylnaphthalene	-4.57	0	0.2	5.789
n-Butyl acetate	-5.70	0	0.45	3.353
Nitrobenzene	-4.98	0	0.28	4.557
n-Nonane	-6.03	0	0	4.182
Oct-1-yne	-6.29	0.13	0.1	3.521
Pentanal	-6.23	0	0.45	2.851
Phenol	-4.56	0.6	0.31	3.766
Propan-1-ol	-5.90	0.37	0.48	2.031
n-Propylbenzene	-5.83	0	0.15	4.23
Isobutyl formate	-6.49	0	0.4	2.789
1,1,2,2-Tetrachloroethane	-5.91	0.16	0.12	3.803
Tetrachloromethane	-7.24	0	0	2.823
Tetrahydrofuran	-6.43	0	0.48	2.636
Thiophene	-7.29	0	0.15	2.819
Thiophenol	-5.69	0.09	0.16	4.11
n-Undecane	-5.13	0	0	5.191
1,2,4-Trichlorobenzene	-5.04	0	0	5.248
2-Nitrotoluene	-4.87	0	0.28	4.878
n-Pentylbenzene	-5.04	0	0.15	5.23

4. Sorption Coefficients and Compound Parameters

For the distinction of adsorption and absorption in our aerosol samples we refer to the article. The sorption coefficients on diesel soot are normalized to the specific surface area, those on the road tunnel aerosols to the measured OC-mass.

TABLE S2: Logarithmic adsorption coefficients on diesel soot, log $K_{i\ dieselsoot/air}$ (m^3/m^2), for 78 compounds at 15°C, at 50 and 70% RH, derived from IGC measurements (this work), with their corresponding compound parameters taken from refs. (*5-8*), ordered by compound class. Note that only 74 compounds were used for fitting the LFER due to missing compound parameters for 4 compounds. n.v. = no value available.

Compound	log $K_{i\ dieselsoot/air}$ (m^3/m^2)		$\Sigma\alpha_i$	$\Sigma\beta_i$	log $K_{i\ hexadecane/air}$ (m^3/m^3)
	50% RH	70% RH			
n-Hexane	-5.41 ± 0.05		0	0	2.67
n-Heptane	-4.83 ± 0.05		0	0	3.17
n-Octane	-4.25 ± 0.05		0	0	3.68
n-Nonane	-3.70 ± 0.05	-3.82 ± 0.05	0	0	4.18
n-Decane	-3.07 ± 0.05	-3.13 ± 0.05	0	0	4.69
n-Undecane	-2.52 ± 0.05		0	0	5.19
Cyclohexene	-5.39 ± 0.05		0	0.1	3.02
Cyclooctane	-4.31 ± 0.05		0	0	4.33
Non-1-ene	-3.69 ± 0.05		0	0.07	4.07
Hept-1-yne	-4.65 ± 0.05		0.13	0.1	3.00
Oct-1-yne	-4.09 ± 0.05	-4.14 ± 0.05	0.13	0.1	3.52
Trichloromethane	-5.43 ± 0.05		0.15	0.02	2.48
Tetrachloromethane	-5.49 ± 0.05		0	0	2.82
1,2-Dichloroethane	-5.30 ± 0.05	-5.29 ± 0.05	0.1	0.11	2.57
1,1,1-Trichloroethane	-5.39 ± 0.05		0	0.09	2.73
1,1,2,2-Tetrachloroethane	-3.87 ± 0.05		0.16	0.12	3.80
1,4-Dichlorobutane	-3.79 ± 0.05		0	0.17	n.v.
1-Chloropentane	-4.67 ± 0.05	-4.68 ± 0.05	0	0.1	3.22
1-Chloroheptane	-3.47 ± 0.05		0	0.1	4.28
(Z)-1,2-Dichloroethene	-5.55 ± 0.05		0.11	0.05	2.44
Trichloroethene	-5.19 ± 0.05		0.08	0.03	3.00
Tetrachloroethene	-4.76 ± 0.05		0	0	3.58
1-Bromopentane	-4.25 ± 0.05		0	0.12	3.61
1-Iodopropane	-4.98 ± 0.05		0	0.15	3.13
Benzene	-5.23 ± 0.05		0	0.14	2.79
Toluene	-4.52 ± 0.05		0	0.14	3.33
Ethylbenzene	-4.08 ± 0.05	-4.15 ± 0.05	0	0.15	3.78
n-Propylbenzene	-3.67 ± 0.05		0	0.15	4.23
n-Pentylbenzene	-2.52 ± 0.05		0	0.15	5.23
p-Xylene	-3.93 ± 0.05		0	0.16	3.84
Styrene	-3.80 ± 0.05		0	0.16	3.86
1,2,4-Trimethylbenzene	-3.32 ± 0.05		0	0.19	4.44
1,3,5-Trimethylbenzene	-3.24 ± 0.05		0	0.19	4.34
Indane	-3.35 ± 0.05		0	0.17	4.59
Chlorobenzene	-4.29 ± 0.05	-4.35 ± 0.05	0	0.07	3.66
1,2-Dichlorobenzene	-3.22 ± 0.05		0	0.04	4.52
1,3-Dichlorobenzene	-3.41 ± 0.05		0	0.02	4.41
1,4-Dichlorobenzene	-3.40 ± 0.05		0	0.02	4.44
1,2,4-Trichlorobenzene	-2.51 ± 0.05		0	0	5.25

TABLE S2: continued

Compound	$\log K_{i\ dieselsoot/air}$ (m^3/m^2)		$\Sigma\alpha_i$	$\Sigma\beta_i$	$\log K_{i\ hexadecane/air}$ (m^3/m^3)
	50% RH	70% RH			
Bromobenzene	-3.85 ± 0.05		0	0.09	4.04
Iodobenzene	-3.29 ± 0.05		0	0.12	4.50
Fluorobenzene	-5.09 ± 0.05		0	0.1	2.79
4-Fluorotoluene	-4.33 ± 0.05		0	0.1	3.37
Di-ethyl ether	-5.25 ± 0.05	-5.44 ± 0.05	0	0.45	2.02
Diisopropyl ether	-4.57 ± 0.05		0	0.45	2.48
Di-n-propyl ether	-4.24 ± 0.05		0	0.45	2.95
Di-n-butyl ether	-3.29 ± 0.05	-3.39 ± 0.05	0	0.45	3.92
MTBE	-4.75 ± 0.05		0	0.45	2.38
Tertamylmethylether TAME	-4.25 ± 0.05		n.v.	n.v.	n.v.
Tertbutylethylether ETBE	-4.82 ± 0.05		n.v.	n.v.	n.v.
Tetrahydrofuran	-4.69 ± 0.05		0	0.48	2.64
1,4-Dioxane	-4.10 ± 0.05		0	0.64	2.89
Methyl phenyl ether/Anisole	-3.62 ± 0.05		0	0.29	3.89
Propanone/Acetone	-5.08 ± 0.05		0.04	0.51	1.70
2-Butanone	-4.59 ± 0.05		0	0.51	2.29
3-Methylbutan-2-one	-4.23 ± 0.05	-4.35 ± 0.05	0	0.51	2.69
Cyclopentanone	-3.77 ± 0.05		0	0.52	3.22
Pentanal	-4.23 ± 0.05		0	0.45	2.85
Benzaldehyde	-3.15 ± 0.05		0	0.39	4.01
Methyl acetate	-5.21 ± 0.05		0	0.45	1.91
Ethyl acetate	-4.63 ± 0.05	-4.70 ± 0.05	0	0.45	2.31
Isobutyl acetate	-3.53 ± 0.05		0	0.47	3.16
n-Butyl acetate	-3.38 ± 0.05		0	0.45	3.35
Tertbutylformat	-4.64 ± 0.05		n.v.	n.v.	n.v.
Ethanol	-4.58 ± 0.05	-4.70 ± 0.05	0.37	0.48	1.49
Propan-1-ol	-4.10 ± 0.05	-4.19 ± 0.05	0.37	0.48	2.03
Propan-2-ol/Isopropanol	-4.33 ± 0.05		0.33	0.56	1.76
2-Methylpropan-1-ol	-3.63 ± 0.05		0.37	0.48	2.41
2-Methylpropan-2-ol	-4.04 ± 0.05		0.31	0.6	1.96
Butan-1-ol	-3.43 ± 0.05		0.37	0.48	2.60
Cyclopentanol	-3.09 ± 0.05		0.32	0.56	3.24
2,2,2-Trifluoroethanol	-4.60 ± 0.05		0.57	0.25	1.22
Butyronitrile	-4.30 ± 0.05	-4.31 ± 0.05	0	0.36	2.55
Benzonitrile	-2.85 ± 0.05		0	0.33	4.04
Nitrobenzene	-2.71 ± 0.05		0	0.28	4.56
2-Nitrotoluene	-2.37 ± 0.05		0	0.28	4.88
n-Propanethiol	-5.43 ± 0.05		0	0.24	2.69
Thiophene	-5.27 ± 0.05		0	0.15	2.82
Minimum value	-5.55		0	0	1.22
Maximum value	-2.37		0.57	0.64	5.25

TABLE S3: Logarithmic absorption coefficients from air (= a) to road tunnel aerosols, $\log K_{i\ road\ tunnel/air}$ (m^3/g OC), for 69 compounds at 15°C, at 50% RH, derived from IGC measurements (this work), with their corresponding compound parameters taken from refs. (*5-8*), ordered by compound class. Note that only 66 compounds were used for fitting the LFER due to missing compound parameters for 3 compounds. n.v. = no value available.

Compound	$\log K_{i\ roadtunnel/a}$ (m^3/g OC) 50% RH	$\Sigma\alpha_i$	$\Sigma\beta_i$	$\log K_{i\ hexadecane/a}$ (m^3/m^3)	molar Volume (10^{-4} m^3/mol)
n-Hexane	-3.51 ± 0.04	0	0	2.67	0.95
n-Heptane	-2.98 ± 0.04	0	0	3.17	1.09
n-Octane	-2.47 ± 0.04	0	0	3.68	1.24
n-Nonane	-1.92 ± 0.04	0	0	4.18	1.38
n-Decane	-1.45 ± 0.04	0	0	4.69	1.52
n-Undecane	-1.00 ± 0.04	0	0	5.19	1.66
Non-1-ene	-2.00 ± 0.04	0	0.07	4.07	1.33
Hept-1-yne	-2.81 ± 0.04	0.13	0.1	3.00	1.01
Oct-1-yne	-2.31 ± 0.04	0.13	0.1	3.52	1.15
Cyclohexene	-3.08 ± 0.04	0	0.1	3.02	0.80
Cycloheptane	-2.48 ± 0.04	0	0	3.70	0.99
Cyclooctane	-1.88 ± 0.04	0	0	4.33	1.56
Trichloromethane	-3.11 ± 0.04	0.15	0.02	2.48	0.62
Tetrachloromethane	-3.11 ± 0.04	0	0	2.82	0.74
1,2-Dichloroethane	-2.98 ± 0.04	0.1	0.11	2.57	0.64
1,1,1-Trichloroethane	-3.12 ± 0.04	0	0.09	2.73	0.76
1,1,2,2-Tetrachloroethane	-1.48 ± 0.04	0.16	0.12	3.80	0.88
(Z)-1,2-Dichloroethene	-3.19 ± 0.04	0.11	0.05	2.44	0.59
Trichloroethene	-2.79 ± 0.04	0.08	0.03	3.00	0.71
1-Bromopentane	-2.18 ± 0.04	0	0.12	3.61	0.99
1-Iodopropane	-2.70 ± 0.04	0	0.15	3.13	0.79
Benzene	-3.01 ± 0.04	0	0.14	2.79	0.72
Toluene	-2.48 ± 0.04	0	0.14	3.33	0.86
Ethylbenzene	-2.04 ± 0.04	0	0.15	3.78	1.00
n-Propylbenzene	-1.67 ± 0.04	0	0.15	4.23	1.14
p-Xylene	-1.97 ± 0.04	0	0.16	3.84	1.00
Styrene	-1.80 ± 0.04	0	0.16	3.86	0.96
1,2,4-Trimethylbenzene	-1.39 ± 0.04	0	0.19	4.44	1.14
Indane	-1.44 ± 0.04	0	0.17	4.59	1.03
Chlorobenzene	-2.04 ± 0.04	0	0.07	3.66	0.84
1,2-Dichlorobenzene	-1.15 ± 0.04	0	0.04	4.52	0.96
1,3-Dichlorobenzene	-1.27 ± 0.04	0	0.02	4.41	0.96
1,4-Dichlorobenzene	-1.26 ± 0.04	0	0.02	4.44	0.96
Bromobenzene	-1.59 ± 0.04	0	0.09	4.04	0.89
Fluorobenzene	-2.95 ± 0.04	0	0.1	2.79	0.73
Di-ethyl ether	-3.87 ± 0.04	0	0.45	2.02	0.73
Diisopropyl ether	-3.49 ± 0.04	0	0.45	2.48	1.01
Di-n-propyl ether	-3.05 ± 0.04	0	0.45	2.95	1.01
Di-n-butyl ether	-2.05 ± 0.04	0	0.45	3.92	1.29

TABLE S3: continued

Compound	log $K_{i\ road\ tunnel/a}$ (m^3/g OC) 50% RH	$\Sigma\alpha_i$	$\Sigma\beta_i$	log $K_{i\ hexadecane/a}$ (m^3/m^3)	molar Volume (10^{-4} m^3/mol)
MTBE	-3.64 ± 0.04	0	0.45	2.38	0.87
Tertamylmethylether TAME	-3.10 ± 0.04	n.v.	n.v.	n.v.	n.v.
Tertbutylethylether ETBE	-3.42 ± 0.04	n.v.	n.v.	n.v.	n.v.
Tetrahydrofuran	-3.11 ± 0.04	0	0.48	2.64	0.62
1,4-Dioxane	-2.65 ± 0.04	0	0.64	2.89	0.68
2-Propanone	-3.64 ± 0.04	0.04	0.51	1.70	0.55
2-Butanone	-3.22 ± 0.04	0	0.51	2.29	0.69
3-Methylbutan-2-one	-3.01 ± 0.04	0	0.51	2.69	0.83
Cyclopentanone	-2.20 ± 0.04	0	0.52	3.22	0.72
Methyl acetate	-3.61 ± 0.04	0	0.45	1.91	0.61
Ethyl acetate	-3.27 ± 0.04	0	0.45	2.31	0.75
Isobutyl acetate	-2.53 ± 0.04	0	0.47	3.16	1.03
n-Butyl acetate	-2.31 ± 0.04	0	0.45	3.35	1.03
Tertbutylformate	-3.34 ± 0.04	n.v.	n.v.	n.v.	n.v.
Pentanal	-2.80 ± 0.04	0	0.45	2.85	0.83
Benzaldehyde	-1.31 ± 0.04	0	0.39	4.01	0.87
Ethanol	-3.05 ± 0.04	0.37	0.48	1.49	0.45
Propan-1-ol	-2.74 ± 0.04	0.37	0.48	2.03	0.59
Propan-2-ol/Isopropanol	-3.17 ± 0.04	0.33	0.56	1.76	0.59
2-Methylpropan-1-ol	-2.62 ± 0.04	0.37	0.48	2.41	0.73
2-Methylpropan-2-ol	-3.16 ± 0.04	0.31	0.6	1.96	0.73
Butan-1-ol	-2.27 ± 0.04	0.37	0.48	2.60	0.73
Cyclopentanol	-1.74 ± 0.04	0.32	0.56	3.24	0.76
2,2,2-Trifluoroethanol	-2.95 ± 0.04	0.57	0.25	1.22	0.50
1-Cyanopropane /Butanenitrile	-2.81 ± 0.04	0	0.36	2.55	0.69
Benzonitrile	-1.22 ± 0.04	0	0.33	4.04	0.87
Nitrobenzene	-0.75 ± 0.04	0	0.28	4.56	0.89
Ethanethiol	-3.80 ± 0.04	0	0.24	2.17	0.55
n-Propanethiol	-3.31 ± 0.04	0	0.24	2.69	0.69
Thiophen	-2.91 ± 0.04	0	0.15	2.82	0.64
Minimum value	-3.87	0.00	0.00	1.22	0.45
Maximum value	-0.75	0.57	0.64	5.19	1.66

5. Error Calculation

The errors for $\log K_{i\ diesel\ soot/air}$ coefficients have been calculated by the following formula:

$$\Delta \log K_{i\ diesel\ soot/air} = \sqrt{\left(\frac{1}{\ln 10}\right)^2 \left(\left[\frac{\Delta V_{i\ net}}{V_{i\ net}}\right]^2 + \left[\frac{\Delta m_{diesel\ soot}}{m_{diesel\ soot}}\right]^2 + \left[\frac{\Delta SSA_{diesel\ soot}}{SSA_{diesel\ soot}}\right]^2\right)} \quad \text{(S2)}$$

where $V_{i\ net}$ is the net retention volume, $m_{diesel\ soot}$ is the mass of diesel soot in the column packing, and $SSA_{diesel\ soot}$ is the specific surface area of diesel soot. The uncertainty of $\Delta SSA_{diesel\ soot}$ is not given by NIST and was estimated to be 5% of $SSA_{diesel\ soot}$. $\Delta m_{diesel\ soot}$ is 0.04 mg, and $\Delta V_{i\ net}$ is 10% of $V_{i\ net}$, which is an estimate based on our experience and repetitive experiments for selected compounds. The overall error is mainly dominated by the error of $V_{i\ net}$. The relative error in $K_{i\ diesel\ soot/air}$ is 11% and in $\log K_{i\ diesel\ soot/air}$ 1 to 2% for all compounds.

The errors for $\log K_{i\ road\ tunnel/air}$ coefficients have been calculated by the following formula:

$$\Delta \log K_{i\ aerosol/air} = \sqrt{\left(\frac{1}{\ln 10}\right)^2 \left(\left[\frac{\Delta V_{i\ net}}{V_{i\ net}}\right]^2 + \left[\frac{\Delta m_{aerosol}}{m_{aerosol}}\right]^2\right)} \quad \text{(S3)}$$

where $\Delta m_{road\ tunnel}$ is 0.04 mg and $\Delta V_{i\ net}$ is 10% of $V_{i\ net}$. The overall error is also mainly dominated by the error of $V_{i\ net}$. The relative error in $K_{i\ road\ tunnel/air}$ is 10% and in $\log K_{i\ road\ tunnel/air}$ 1 to 6% for all compounds.

6. Prevailing Sorption Mechanisms Based on EC- and OC-Content

Table S4 gives calculated contributions of measured and possible aerosol components to the measured sorption for selected compounds.

TABLE S4: Potential contribution (in %) of various sorption processes to the total measured sorption of selected compounds (at 50% RH). Contribution of OM was simulated using three solvent/air partitioning coefficients for OM/air partitioning: hexadecane, octanol and methanol[a]. The values refer to $K_{i\ solvent/air}$ normalized to the OC-content (g) of the solvent, divided by $K_{i\ aerosol/air}$ normalized to the OC-content (g) of the aerosols. Contribution of surfaces was simulated by typical inorganic airborne materials for the non-carbonaceous aerosol fraction[b] (i.e., not identified as EC or OC). The values refer to $K_{i\ surface/air}$ divided by $K_{i\ aerosol/air}$, both normalized to the total surface area (m^2) of the aerosols. Possible adsorption to EC was calculated only for the road tunnel aerosols but not for diesel soot, because it could only be estimated with results derived from our data set for the diesel soot itself (for details see text).

	Compound	Max. absorption into aerosol-OM simulated by organic solvents in %			Max. adsorption on inorganic material simulated by typical airborne materials in %			Max. adsorption possible on EC[c]
		Hexadecane	Octanol	Methanol	$(NH_4)_2SO_4$	NaCl	Quartz	
Diesel soot	n-Octane	15	4	4	0	0	0	
	1,1,1-Trichloroethane	20	17	35	0	0	0	
	n-Propylbenzene	15	12	16	0	0	0	
	Di-n-butyl ether	3	2	7	0	1	4	
	3-Methylbutan-2-one	1	5	20	0	1	5	
	Butan-1-ol	0	11	33	1	1	7	
Road tunnel	n-Octane	390	94	120	4	3	6	24
	1,1,1-Trichloroethane	170	150	300	6	5	11	17
	n-Propylbenzene	230	190	260	7	6	19	36
	Di-n-butyl ether	270	230	630	97	140	1000	220
	3-Methylbutan-2-one	120	460	1900	110	200	1500	120
	Butan-1-ol	17	1300	3700	310	420	2300	150

[a] $K_{i\ hexadecane/air}$ from (*5*,*8*); $K_{i\ methanol/air}$ from (*9*); $K_{i\ octanol/air}$: from $K_{i\ octanol/water}$ (*7*,*10*) and $K_{i\ water/air}$ (*6*); $K_{i\ octanol/air}$ and $K_{i\ methanol/air}$ extrapolated to 15°C with $\Delta H_{i\ vap}$ (*11*); $K_{i\ hexadecane/air}$ extrapolated to 15°C with $\Delta H_{i\ hexadecane/air}$ (*12*)

[b] Contribution of adsorption to other surfaces was calculated with an average $SSA_{non\text{-}carbon}$ (2.5 m^2/g for calculation for diesel soot and road tunnel), the mass of non-carbonaceous material (19% for diesel soot, 87% for road tunnel aerosol) and surface parameters for 40% RH (NaCl and $(NH_4)_2SO_4$) and 45% RH (Quartz), taken from literature (*2*,*3*). At 50% RH, adsorption to these materials would be even less.

[c] Contribution of adsorption to EC for the road tunnel aerosols was calculated with the EC-content (4.1%), an assumed SSA_{EC} (50 m^2/g) and the adsorption model derived from diesel soot adsorption (Eq. (5)).

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