

ESTERS

物質		CAS No.	ISO	EC	72	測定対象
物質名						
1	vinylacetate	108-05-4	○			○
2	Butylformate	592-84-7	○			○
3	Isobutyl acetate	110-19-0	○			○
4	Ethylacetate	141-78-6	○	○	○	○
5	Propylacetate	109-60-4	○			○
6	Butylacetate	123-86-4	○	○	○	○
7	Isopropylacetate	108-21-4	○	○	○	○
8	2-Methoxyethylacetate	110-49-6	○			○
9	2-Ethoxyethylacetate	111-15-9	○	○	○	○
10	2-Ethylhexyl acetate	103-09-3	○			○
11	Linalool acetate	115-95-7	○			○
12	Methacrylic acid methyl ester	80-62-6	○			○
13	TXIB	6846-50-0	○	○	○	○

PHTHALATES

物質		CAS No.	ISO	EC	72	測定対象
物質名						
1	Dimethyl phthalate	131-11-3	○			○
2	Dibutyl phthalate	84-74-2	○			○
3	Alkyl phthalates		○			○

OTHER

物質		CAS No.	ISO	EC	72	測定対象
物質名						
1	1,4-Dioxane	123-91-1	○		○	○
2	n-Methyl-2-pyrrolidone	872-50-4	○			○
3	Caprolactam	105-60-2	○			○
4	Indene	95-13-6	○			○
5	2-Pentylfuran	3777-69-3	○	○	○	○
6	THF(Tetrahydrofuran)	109-99-9	○	○	○	○

表4 両測定法における測定結果

化学物質	n				平均				中央値				幾何平均				最大				90%値		
	溶媒	加熱	添加	濃度	溶媒	加熱	添加	濃度	溶媒	加熱	添加	濃度	溶媒	加熱	添加	濃度	溶媒	加熱	添加	濃度	溶媒	加熱	溶媒
Benzene	56	60	60	2.911	3.618	0.805	2.946	1.802	2.946	0.612	2.665	3.433	0.776	34.943	19.363	9.459	8.813						
Toluene	60	59	60	37.626	34.116	1.103	28.529	30.336	0.940	31.805	30.289	1.050	1240.418	779.881	224.266	113.716							
Ethylbenzene	60	59	60	10.008	7.888	1.289	7.309	6.322	1.156	8.562	7.083	1.209	201.404	209.651	39.284	22.777							
m-Xylene	60	59	60	12.197	11.921	1.023	9.798	9.352	1.048	10.667	10.858	0.982	139.898	131.420	51.533	41.203							
o-Xylene	60	59	60	6.386	5.544	1.152	4.181	3.754	1.114	5.610	5.078	1.105	52.982	50.185	24.762	18.887							
Isopropylbenzene	31	53	54	0.791	1.253	0.631	0.360	0.985	0.365	0.738	1.217	0.606	6.195	6.964	2.240	2.552							
1-Propenylbenzene(C&T)	2	41	1	0.001	0.016	0.052	0.000	0.000	0.000	0.000	0.001	0.015	0.055	0.024	1.086	0.000							
n-Propylbenzene	48	60	56	1.883	2.460	0.765	1.213	1.834	0.661	1.690	2.363	0.711	16.725	10.465	6.700	6.204							
1,2,4-Trimethylbenzene	60	59	60	8.212	7.658	1.072	6.482	5.863	1.106	7.031	6.952	1.011	57.000	50.031	40.035	27.859							
1,3,5-Trimethylbenzene	56	60	59	3.168	3.554	0.891	1.947	2.689	0.721	2.808	3.387	0.829	20.906	15.367	13.419	9.470							
1,2,3-Trimethylbenzene	51	60	58	60	3.340	3.896	2.344	3.041	0.771	2.965	3.691	0.803	34.843	20.586	8.904	9.039							
1,2,4,5-Tetramethylbenzene	36	60	50	60	0.909	2.407	0.378	0.417	2.709	0.154	2.330	0.348	29.298	6.112	1.977	3.940							
1-Methyl-3-propylbenzene	34	53	48	60	1.148	2.096	0.548	0.828	1.717	0.482	1.064	1.971	0.540	7.060	10.801	3.504	5.408						
n-Butylbenzene	19	53	7	60	0.464	0.227	2.040	0.000	0.000	0.000	0.428	0.203	2.110	4.373	4.530	0.918							
1,3-Disopropylbenzene	3	53	2	60	0.001	0.060	0.011	0.000	0.000	0.000	0.001	0.054	0.012	0.014	2.418	0.000							
1,4-Disopropylbenzene	3	53	2	60	0.000	0.056	0.007	0.000	0.000	0.000	0.000	0.051	0.007	0.008	2.189	0.000							
Ethylbenzene	7	53	0	60	0.058	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000							
o-Methylstyrene	4	53	0	60	0.015	0.000	0.000	0.000	0.000	0.000	0.015	0.000	0.000	0.000	0.000	0.000							
p-Methylstyrene	4	27	1	60	0.002	0.026	0.064	0.000	0.000	0.000	0.002	0.024	0.070	0.019	1.826	0.000							
α-Methylstyrene	4	27	0	60	0.040	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.000	0.398	0.000	0.197							
β-Methylstyrene	4	27	0	60	0.004	0.606	0.006	0.000	0.000	0.004	0.571	0.007	0.069	3.335	0.005	1.765							
Styrene	52	60	59	60	2.947	3.634	0.811	1.910	2.370	0.806	1.920	3.421	0.765	19.209	9.826	11.907							
2-Ethyltoluene	30	60	59	60	1.369	3.622	0.378	0.069	2.375	0.029	1.055	3.278	0.322	82.807	126.269	3.307							
Naphthalene	32	60	59	60	0.718	3.488	0.206	0.092	2.882	0.032	0.608	3.405	0.179	41.812	16.422	1.907							
4-Phenylcyclohexene	9	60	1	60	0.101	0.045	2.221	0.000	0.000	0.000	0.652	5.383	1.234	360.976	75.415	41.005							
n-Hexane	22	24	60	60	8.472	6.172	0.372	6.159	4.408	1.397	6.852	2.449	0.486	11.760	19.870	8.480							
2-Methylhexane	22	41	58	60	1.371	2.602	0.527	0.432	1.759	0.245	1.189	2.449	0.486	11.760	19.870	8.480							
3-Methylhexane	25	41	60	60	1.631	2.048	0.796	0.639	1.447	0.442	1.418	1.939	0.731	13.280	21.059	9.120							
n-Heptane	35	38	56	60	5.301	3.253	1.629	3.516	1.969	1.786	4.532	2.902	1.562	76.480	22.630	15.999							
n-Octane	38	53	56	60	4.325	3.884	1.113	2.158	1.513	1.426	3.505	3.291	1.065	88.480	42.603	19.897							
n-Nonane	45	53	59	60	6.828	8.050	0.848	2.813	4.065	0.692	5.400	6.993	1.012	36.464	40.460	16.377							
2-Methyloctane	35	53	36	60	3.030	3.006	1.008	1.184	1.209	0.979	2.488	2.458	0.843	30.049	29.462	14.212							
2-Methylnonane	31	53	44	60	1.987	2.706	0.735	0.897	1.365	1.667	1.667	2.362	0.714	17.700	20.386	7.990							
3,5-Dimethyloctane	22	53	34	60	0.887	1.190	0.583	0.000	0.674	0.000	0.618	1.070	0.577	7.250	12.314	2.439							
n-Decane	59	60	59	60	11.033	9.045	1.220	7.899	4.267	1.851	9.046	7.541	1.199	118.630	109.859	61.763							
n-Undecane	56	60	60	60	9.063	8.039	1.120	4.861	5.354	0.908	7.282	6.917	1.053	124.042	151.894	56.644							
n-Dodecane	59	60	60	60	8.982	7.212	1.245	4.775	3.637	4.098	8.888	5.257	0.906	336.600	110.654	39.476							
n-Tridecane	49	60	60	60	6.825	6.520	1.047	3.314	3.546	0.934	4.066	4.216	0.964	233.000	76.868	11.552							
n-Tetradecane	30	60	10	60	1.763	0.270	1.516	0.221	0.000	0.000	1.515	0.239	6.343	83.624	5.322								
n-Pentadecane	30	55	15	60	0.928	0.613	1.516	0.221	0.000	0.000	0.847	0.550	1.542	8.640	5.295								
n-Hexadecane	28	34	56	60	3.301	1.763	1.873	1.942	1.695	1.146	2.839	1.687	1.884	31.040	19.927								
2-Methylpentane	28	34	57	60	2.711	3.268	0.829	1.820	1.635	0.572	2.415	3.090	0.781	25.087	25.677								
3-Methylpentane	28	34	57	60	0.550	0.008	0.000	0.000	0.000	0.000	0.424	0.008	55.166	43.206									
1-Octene	11	53	1	60	0.125	0.194	0.507	0.247	0.000	0.000	0.112	0.451	0.250	2.640	3.042								
1-Decene	7	60	13	60	0.263	0.157	0.438	0.000	0.000	0.000	0.119	0.417	1.388	50.174	9.135								
2,4-Dimethylpentane	13	34	40	60	0.660	0.030	0.542	0.000	0.000	0.000	0.487	0.119	4.107	16.510	4.100								
2,2,4-Trimethylpentane	15	34	8	60	0.577	0.132	4.388	0.000	0.000	0.000	0.109	0.188	1.327	2.640	3.042								
Methylcyclopentane	26	34	59	60	2.021	1.308	1.345	1.139	0.979	1.163	1.758	1.267	1.388	50.174	9.135								
Cyclohexane	28	44	52	60	1.356	1.827	0.742	0.663	1.048	0.633	1.215	1.598	0.760	22.300	33.392								
1,4-Dimethylcyclohexane (O&T)	25	53	38	60	1.241	0.849	1.462	0.000	0.206	0.000	1.023	0.771	2.030	0.381	21.948								
trans-1-Methyl-4-methylcyclohexane	8	53	1	60	0.100	0.036	2.801	0.000	0.000	0.000	0.093	0.032	2.829	2.638									
cis-1-Methyl-4-methylcyclohexane	4	43	1	60	0.168	0.030	5.632	0.000	0.000	0.000	0.153	0.027	5.694	4.216									
Methylcyclohexane	29	55	45	60	1.361	1.720	0.791	0.305	0.763	0.400	1.176	1.542	0.564	20.500	14.009								
3-Carene	39	53	47	60	4.867	7.058	0.689	2.138	3.453	0.619	3.686	5.346	0.686	184.534	504.903								
alpha-Pinene	57	60	60	13.504	33.404	0.404	5.480	21.332	0.257	9.943	21.921	0.454	486.616	5009.910									
(-)-Camphene	23	53	27	60	0.853	5.690	0.150	0.000	0.000	0.000	0.722	3.868	0.187	19.280	213.962								
beta-Pinene	38	60	42	60	1.525	4.011	0.360	0.485	2.809	0.165	1.274	3.373	0.376	86.411	76.321								
Longifolene	10	48	8	60	0.201	0.406	0.495	0.000	0.000	0.000	0.166	0.345	0.588	3.550	10.059								
Caryophyllene	5	49	1	60	0.188	0.125	1.498	0.000	0.000	0.000	0.168	0.089	1.864	4.765	17.057								
Limonene	57	60	58	60	14.492	15.992	0.906	8.310	12.540	0.663	11.208	13.420	0.835	604.878	280.270								
Camphor	26	53	36	60	0.914	2.397	0.381	0.000	1.984	0.000	0.774	2.030	0.381	21.948	55.243								
Menthol	16	53	6	60	0.560	0.352	1.590	0.000	0.000	0.000	0.500	0.293	1.704	7.850	8.502								
1-Propanol	0	26	16	60	0.000	0.486	0.000	0.000	0.000	0.000	0.442	0.000	0.442	0.000									
2-Propanol	7	21	59	60	2.256	7.662	0.294	0.000	4.781	0.000	1.555	6.355	0.245	88.725	892.249								
2-Methyl-2-propanol	0	26	7	60	0.000	0.101	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000									
2-Methyl-1-propanol	17	53	19	60	0.680	0.614	1.106	0.000	0.000	0.000	0.530	0.095	0.950	30.341	5.804								
1-Butanol	33	60	56	60	1.348	4.121	0.327	0.593	3.242	0.183	1.163	3.753	0.310	45.993	1								

表5 溶媒抽出法と加熱脱離法における対数変換測定値の正規性、F検定及びt検定

化学物質	正規性	F検定		t検定		結果
		F値	1%	t値	1%	
Benzene	○	1.5385	○	-1.2692	○	○
Toluene	○	1.5276	○	0.4608	○	○
Ethylbenzene	×	1.5559	○	1.1674	○	○
m-Xylene	○	1.4123	○	0.1264	○	○
o-Xylene	○	1.5862	○	0.7456	○	○
Isopropylbenzene	×	1.5508	○	-2.3893	○	○
1-Propenylbenzene(C&T)	×					
(1-Propenylbenzene(C&T))	×					
n-Propylbenzene	×	2.1793	×			×
1,2,4-Trimethylbenzene	×	1.6278	○	0.3594	○	○
1,3,5-Trimethylbenzene	○	2.2400	×			×
1,2,3-Trimethylbenzene	○	1.9573	○	-0.8576	○	○
1,2,4,5-Tetramethylbenzene	×	2.0659	×			×
1-Methyl-3-propylbenzene	×	0.7278	○	-2.9642	×	×
n-Butylbenzene	×					
1,3-Diisopropylbenzene	×					
1,4-Diisopropylbenzene	×					
Ethynylbenzene	×					
o-Methylstyrene	×					
m-Methylstyrene	×					
p-Methylstyrene	×					
α -Methylstyrene	×	0.0003	×			×
2-Ethyltoluene	○	1.5866	○	-1.1350	○	○
Styrene	×	1.1292	○	-3.1401	×	×
Naphthalene	×	2.1666	×			×
4-Phenylcyclohexene	×	0.8494	○	0.8892	○	○
n-Hexane	×	2.3110	○	1.0008	○	○
2-Methylhexane	×	1.4014	○	-2.6525	×	×
3-Methylhexane	×	2.0413	○	-0.9418	○	○
n-Heptane	○	2.1385	×			×
n-Octane	×	1.4299	○	0.3940	○	○
n-Nonane	×	1.4286	○	-0.6674	○	○
2-Methyloctane	×	1.0074	○	0.0271	○	○
3-Methyloctane	×	1.4509	○	-0.3405	○	○
2-Methylnonane	×	0.9523	○	-1.1334	○	○
3,5-Dimethyloctane	×	0.6728	○	-1.7468	○	○
n-Decane	○	1.1671	○	0.8383	○	○
n-Undecane	○	1.3869	○	0.4710	○	○
n-Dodecane	○	1.8443	○	0.8631	○	○
n-Tridecane	○	2.4337	×			×
n-Tetradecane	×	2.5868	×			×
n-Pentadecane	×	8.5011	×			×
n-Hexadecane	×	1.2766	○	1.3172	○	○
2-Methylpentane	×	6.0218	×			×
3-Methylpentane	×	1.8783	○	-0.8953	○	○
1-Octene	×	834.9698	×			×
1-Decene	×					
2,4-Dimethylpentane	×	2.1282	○	0.7702	○	○
2,2,4-Trimethylpentane	×	7.9803	×			×
Methylcyclopentane	×	7.5383	×			×
Cyclohexane	×	0.5827	○	-0.9394	○	○
1,4-Dimethylcyclohexane (C&T)	×	3.1402	×			×
cis-1-Methyl-4-methylethylcyclohexane	×	1.6365	○	1.0718	○	○
trans-1-Methyl-4-methylethylcyclohexane	×					
Methylcyclohexane	×	1.2124	○	-0.8313	○	○
3-Carene	×	0.7764	○	-1.1307	○	○
alpha-Pinene	×	0.4681	×			×
(+/-)-Camphene	○	0.0934	×			×
beta-Pinene	×	0.5868	○	-3.2197	×	×
Longifolene	×	0.2313	×			×
Caryophyllene	×					
Limonene	○	1.5121	○	-0.3811	○	○
Camphor	×	0.4372	×			×
Menthol	×	0.9395	○	0.9391	○	○

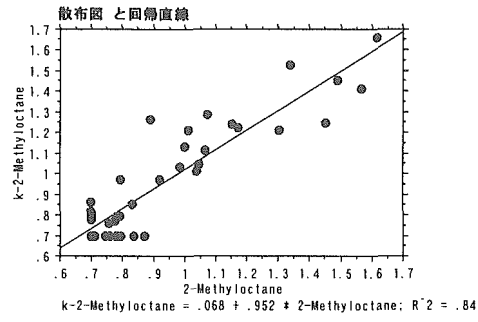
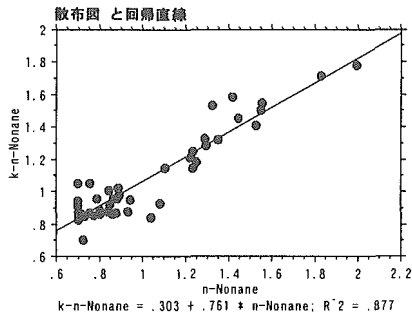
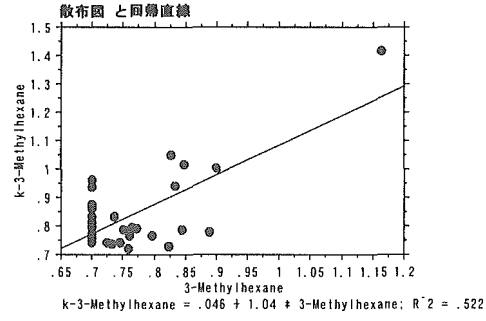
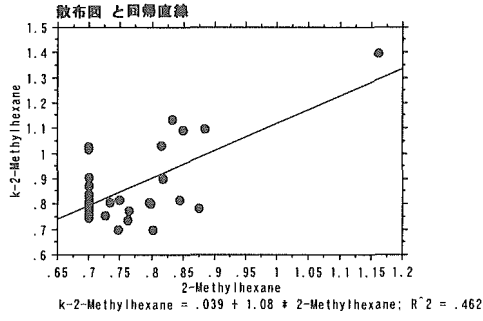
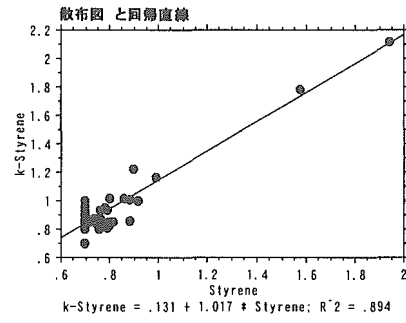
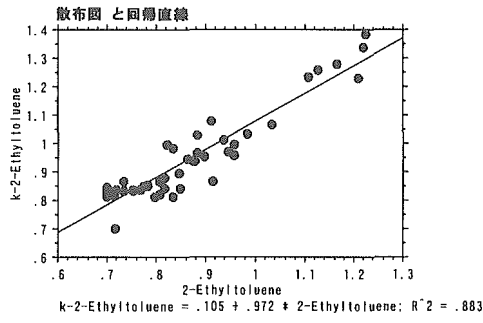
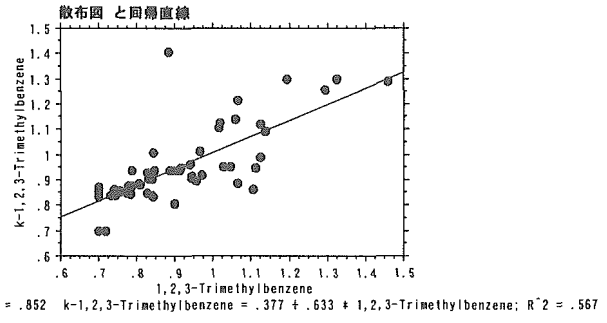
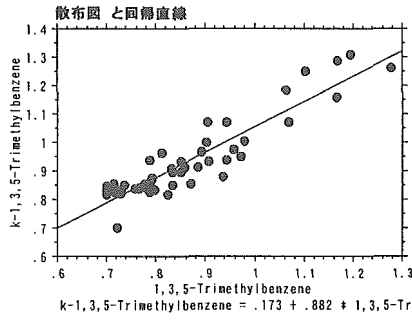
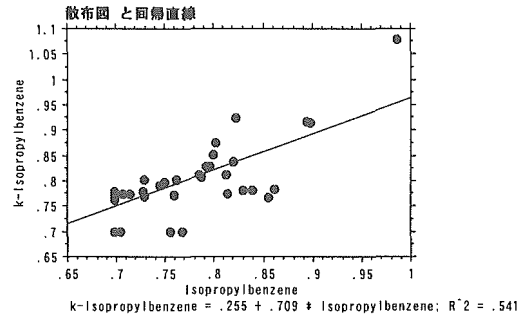
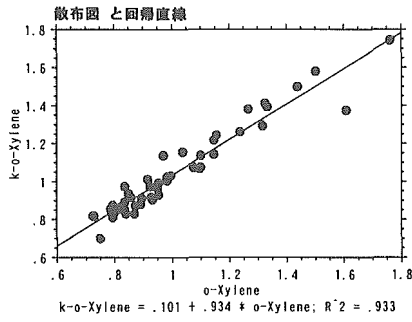
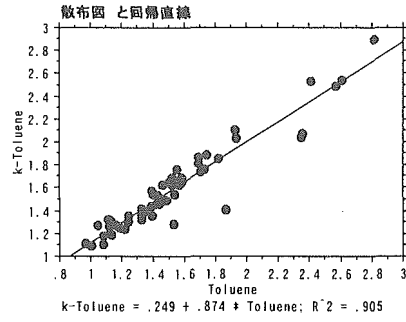
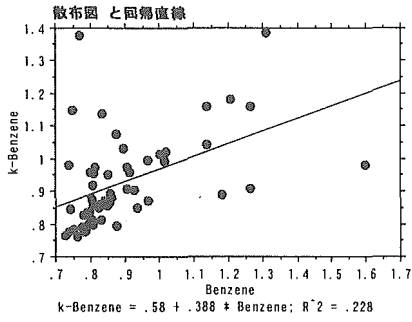
化学物質	正規性	F検定		t検定		結果
		F値	1%	t値	1%	
1-Propanol						
2-Propanol	×	0.8119	○	-2.5351	○	○
2-Methyl-2-propanol	×					
2-Methyl-1-propanol	×	3.6516	×			×
1-Butanol	×					
1-Pentanol	×	0.2009	×			×
1-Hexanol	×					
Cyclohexanol	×					
1-Octanol	×					
2-Ethyl-1-hexanol	×	0.5845	○	-0.1206	○	○
Phenol	×					
Texanol	×	2.7680	×			×
2,6-Di-t-butyl-4-methylphenol (BHT)	×					
Methyl-t-butylether	×					
Ethanol	×					
Propylene glycol	×					
Dimethoxymethane	×					
Dimethoxyethane	×					
2-Methoxyethanol	×					
2-Ethoxyethanol	×	0.5000	○	-0.7233	○	○
2-Butoxyethanol	×	0.1516	×			×
1-Methoxy-2-propanol	×					
2-Butoxyethoxyethanol	×					
2-(2-Ethoxyethoxy)ethanol	×					
Acetone	×	1.1655	○	-3.8283	×	×
3-Methyl-2-butanone	×					
Methylethylketone	×	1.8206	○	-0.2013	○	○
Methylisobutylketone	×	0.8927	○	0.3155	○	○
Acetophenone	×					○
Dichloromethane	×	1.1125	○	-1.7462	○	
Carbon tetrachloride	×					
1,2-Dichloroethane	×	6.7237	×			×
Trichloroethylene	×	1.6490	○	0.9563	○	○
Tetrachloroethylene	×	1.5476	○	0.0018	○	○
1,1,1-Trichloroethane	×	0.1555	×			×
1,4-Dichlorobenzene	×	1.5445	○	-0.0099	○	○
1,2-Dichloropropane	×					
Chlorodibromomethane	×					
Chloroform	×	13.1771	×			×
Methylacetate	×	0.3782	×			×
Vinylacetate	×					
Butylformate	×	0.1657	×			×
Isobutylacetate	×	2.0317	×			×
Ethylacetate	×	0.9592	○	-3.6610	×	×
Propylacetate	×					
Butylacetate	×	1.9302	○	0.3781	○	○
Isopropylacetate	×					
2-Methoxyethylacetate	×					
2-Ethoxyethylacetate	×	0.0362	×			×
2-Ethylhexylacetate	×					
Linaloolacetate	×					
Methacrylic acid methyl ester	×	0.0901	×			×
TXIB	×	0.8734	○	0.0406	○	○
Dimethyl phthalate	×					
Dibutyl phthalate	×	0.6490	○	-2.4684	○	○
1,4-Dioxane	×					
n-Methyl-2-pyrrolidone	×					
Caprolactam	×					
Indene	×					
2-Pentylfuran	×	0.2310	×			×
THF(Tetrahydrofuran)	×	2.5048	×			×
TVOC	○	0.9086	○	-6.5406	×	×
TVOC(e-)	○	1.3001	○	-1.8873	○	○

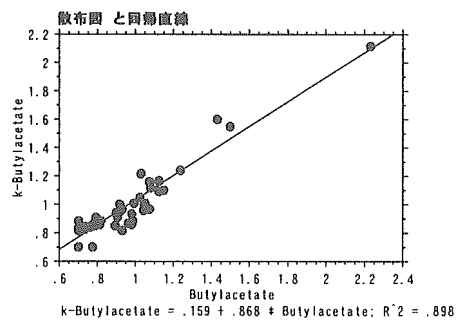
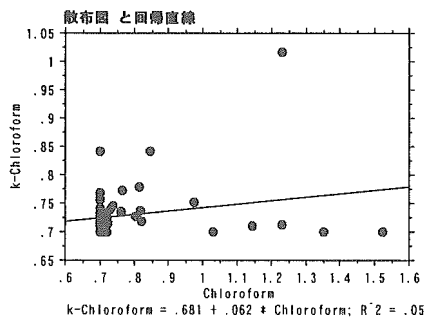
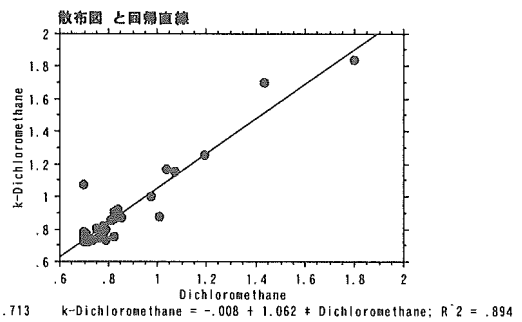
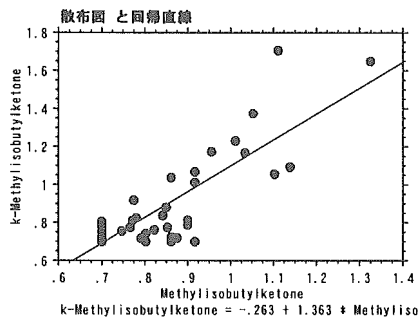
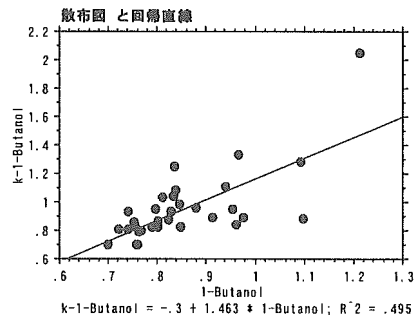
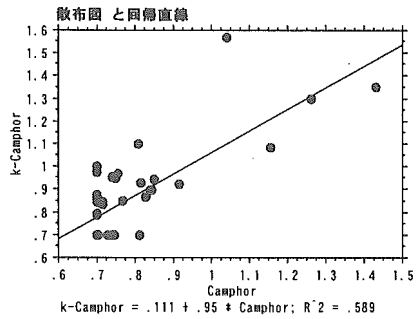
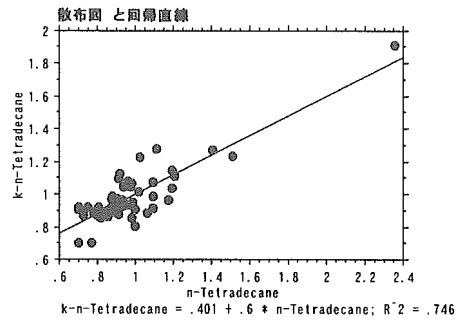
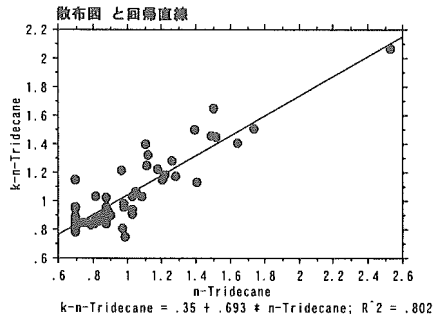
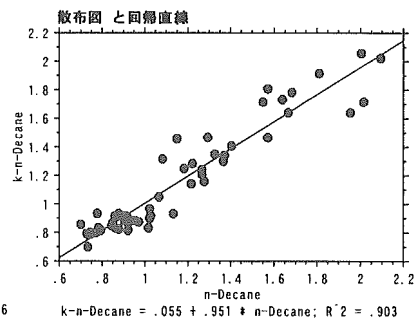
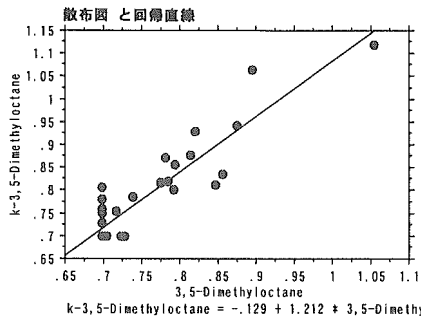
表6 テルペン類の相関関係の回帰直線式および相関係数

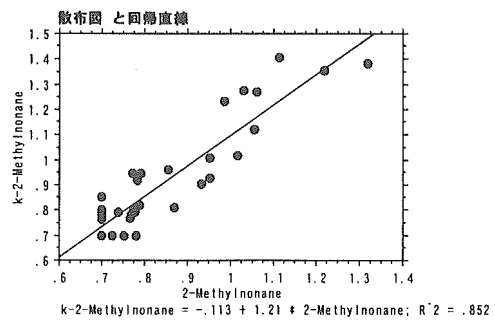
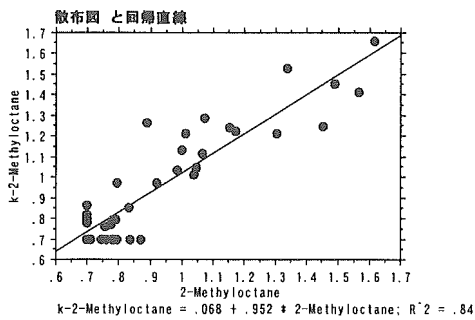
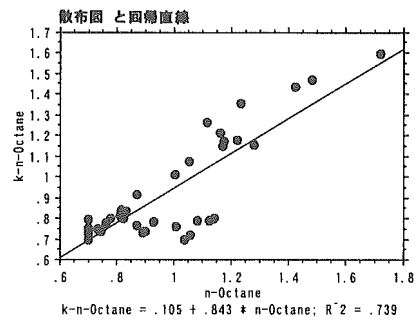
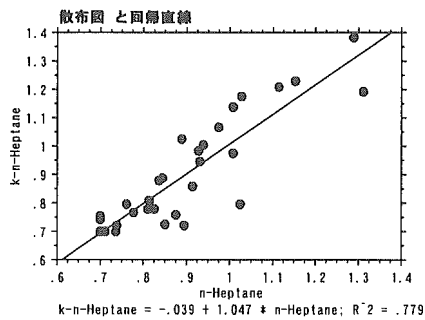
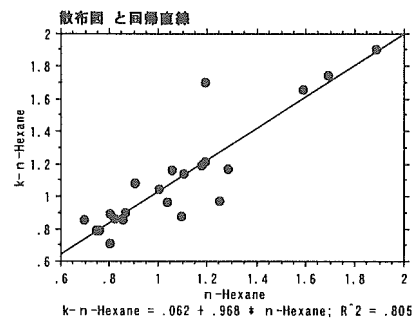
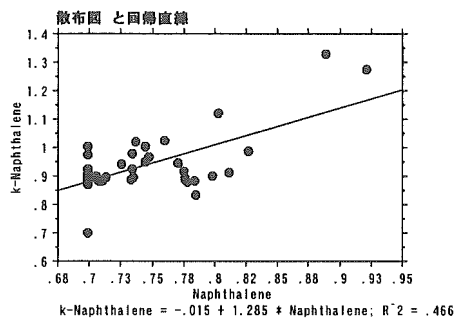
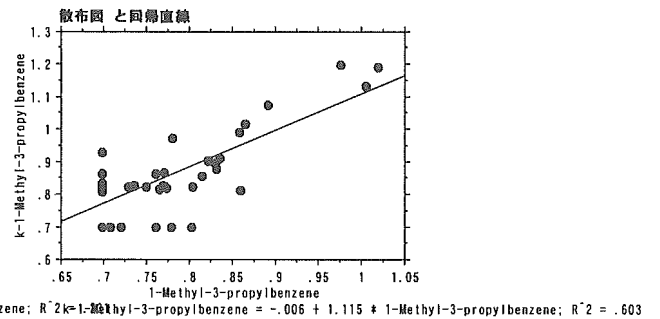
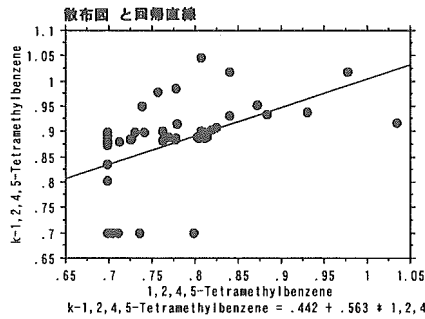
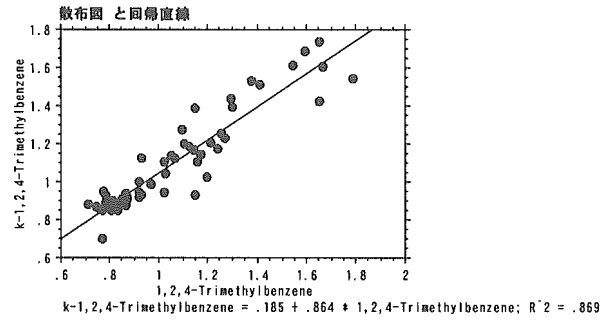
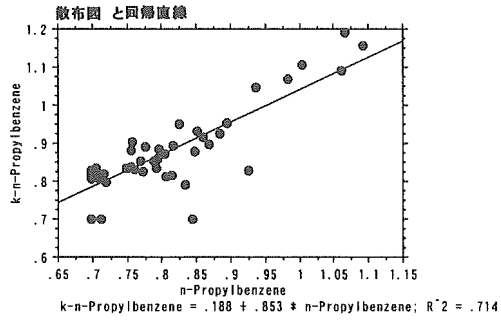
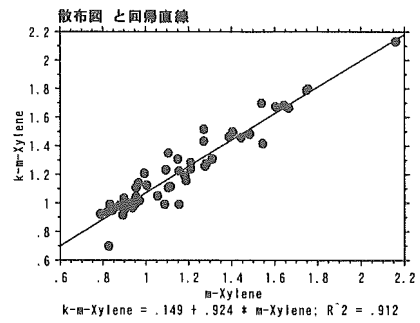
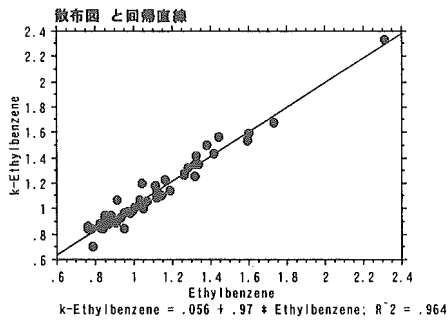
化学物質	相関式	R ²	相関値	P値
3-Carene	$y=13.242+0.915x$	0.115	0.34	0.0123
alpha-Pinene	$y=129.244+2.548x$	0.076	0.276	0.0323
(+/-)-Camphene	$y=12.888+2.378$	0.056	0.237	0.0877
beta-Pinene	$y=3.964+0.805x$	0.65	0.806	<0.0001
Longifolene	$y=0.28+1.691x$	0.344	0.586	<0.0001
Caryophyllene	$y=0.375-0.113x$	0.002	-0.04	0.7854
Limonene	$y=11.821+0.425x$	0.777	0.882	<0.0001
Camphor	$y=2.651+1.043x$	0.181	0.425	0.0013
Menthol	$y=0.154+0.521x$	0.207	0.455	0.0005
total	$y=-70.613+3.709x$	0.649	0.806	<0.0001

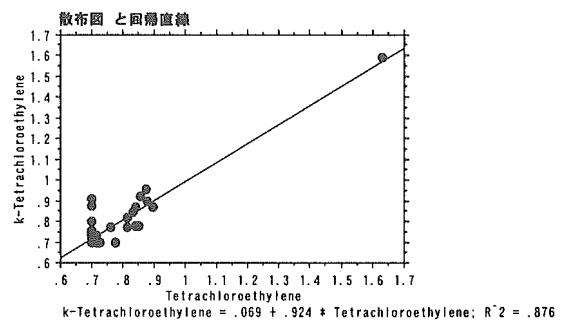
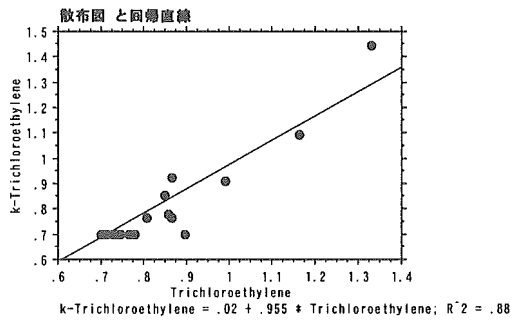
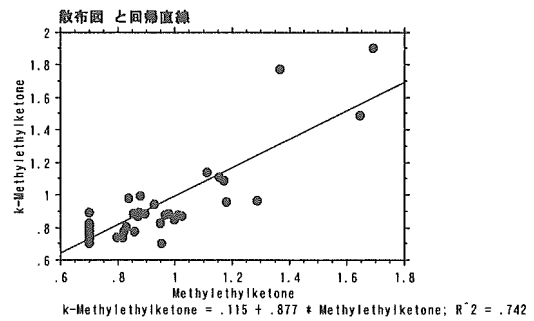
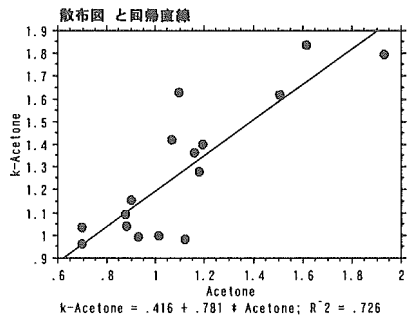
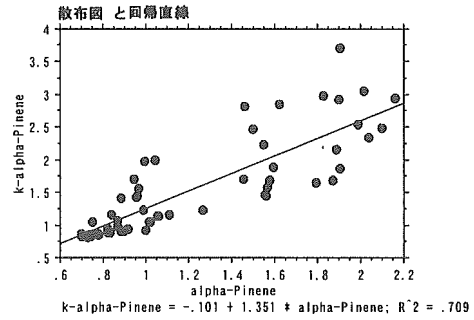
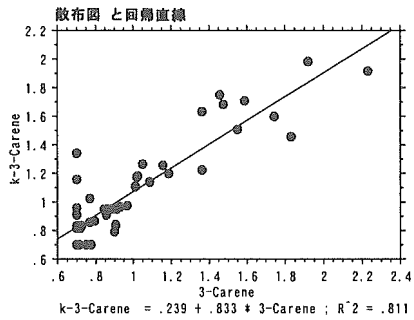
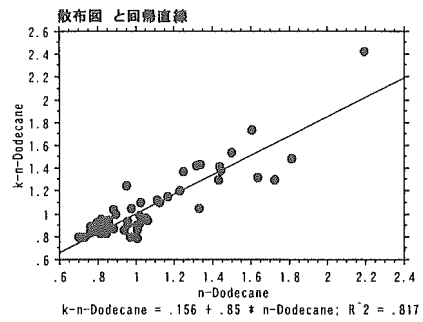
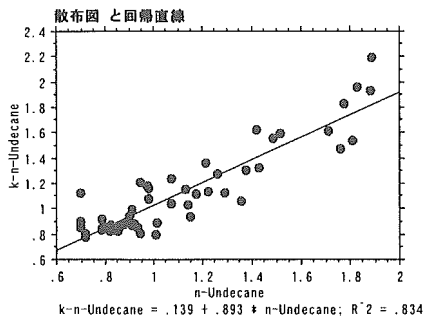
実数

図1 溶媒抽出法と加熱脱離法における各化学物質の散布図(対数表示)









k-化学物質:加熱脱理法による測定値の対数表示

化学物質:溶媒抽出法による測定値の対数表示

表7 溶媒抽出法と加熱脱離法における各化学物質の回帰直線と相関関係

化学物質	相関式	R ²	相関値	P値
Benzene	$y=1.333+0.831x$	0.64	0.8	<0.0001
Toluene	$y=-3.42+0.975x$	0.875	0.935	<0.0001
Ethylbenzene	$y=-1.733+0.901x$	0.844	0.919	<0.0001
m-Xylene	$y=2.11+0.94x$	0.915	0.957	<0.0001
o-Xylene	$y=0.596+0.946x$	0.85	0.922	<0.0001
Isopropylbenzene	$y=0.644+1.029x$	0.735	0.857	<0.0001
1-Propenylbenzene(C&T)				
(1-Propenylbenzene(C&T))				
n-Propylbenzene	$y=1.032+1.085x$	0.806	0.898	<0.0001
1,2,4-Trimethylbenzene	$y=0.839+1.107x$	0.909	0.954	<0.0001
1,3,5-Trimethylbenzene	$y=1.147+1.069x$	0.864	0.929	<0.0001
1,2,3-Trimethylbenzene	$y=1.674+0.667x$	0.723	0.85	<0.0001
1,2,4,5-Tetramethylbenzene	$y=2.053+0.588x$	0.233	0.483	<0.0001
1-Methyl-3-propylbenzene	$y=0.851+1.631x$	0.761	0.872	<0.0001
n-Butylbenzene				
1,3-Diisopropylbenzene				
1,4-Diisopropylbenzene				
Ethynylbenzene				
o-Methylstyrene				
m-Methylstyrene				
p-Methylstyrene				
α -Methylstyrene				
2-Ethyltoluene	$y=0.907+1.281x$	0.915	0.956	<0.0001
Styrene	$y=1.972+1.501x$	0.972	0.986	<0.0001
Naphthalene	$y=2.964+1.255x$	0.358	0.599	<0.0001
4-Phenylcyclohexene				
n-Hexane	$y=2.158+1.041x$	0.822	0.907	<0.0001
2-Methylhexane	$y=1.144+1.797x$	0.69	0.831	<0.0001
3-Methylhexane	$y=0.628+1.818x$	0.761	0.872	<0.0001
n-Heptane	$y=1.469+0.424x$	0.225	0.474	0.0035
n-Octane	$y=0.62+0.783x$	0.819	0.905	<0.0001
n-Nonane	$y=3.043+0.667x$	0.866	0.931	<0.0001
2-Methyloctane	$y=0.489+1.089x$	0.856	0.925	<0.0001
3-Methyloctane	$y=0.851+0.9x$	0.936	0.967	<0.0001
2-Methylnonane	$y=0.732+1.429x$	0.796	0.892	<0.0001
3,5-Dimethyloctane	$y=0.28+1.315x$	0.59	0.768	<0.0001
n-Decane	$y=0.172+1.027x$	0.895	0.946	<0.0001
n-Undecane	$y=-2.191+1.345x$	0.824	0.908	<0.0001
n-Dodecane	$y=-4.249+1.348x$	0.8	0.894	<0.0001
n-Tridecane	$y=4.842+0.326x$	0.854	0.924	<0.0001
n-Tetradecane	$y=2.912+0.332x$	0.946	0.973	<0.0001
n-Pentadecane				
n-Hexadecane	$y=0.431+1.378x$	0.374	0.612	<0.0001
2-Methylpentane	$y=0.374+0.628x$	0.54	0.735	<0.0001
3-Methylpentane	$y=0.625+1.426x$	0.509	0.714	<0.0001
1-Octene				
1-Decene				
2,4-Dimethylpentane				
2,2,4-Trimethylpentane				
Methylcyclopentane				
Cyclohexane	$y=-0.418+2.284x$	0.462	0.68	<0.0001
1,4-Dimethylcyclohexane (C&T)				
cis-1-Methyl-4-methylethylcyclohexane				
trans-1-Methyl-4-methylethylcyclohexane				
Methylcyclohexane				
3-Carene				
alpha-Pinene				
(+/-)-Camphene				
beta-Pinene				
Longifolene				
Caryophyllene				

化学物質	相關式	R ²	相關値	P値
Limonene	$y=7.69+0.656x$	0.878	0.937	<0.0001
Camphor				
Menthol				
1-Propanol				
2-Propanol	$y=-2.928+10.011x$	0.993	0.997	<0.0001
2-Methyl-2-propanol				
2-Methyl-1-propanol				
1-Butanol				
1-Pentanol				
1-Hexanol				
Cyclohexanol				
1-Octanol				
2-Ethyl-1-hexanol				
Phenol				
Texanol				
2,6-Di-t-butyl-4-methylphenol (BHT)				
Methyl-t-butylether				
Dimethoxyethane				
2-Methoxyethanol				
2-Ethoxyethanol				
2-Butoxyethanol				
1-Methoxy-2-propanol				
2-Butoxyethoxyethanol				
2-(2-Ethoxyethoxy)ethanol				
Acetone	$y=6.271+1.383x$	0.742	0.861	<0.0001
3-Methyl-2-butanone				
Methylethylketone	$y=1.269+0.913x$	0.642	0.801	<0.0001
Methylisobutylketone	$y=-0.266+1.615x$	0.429	0.655	<0.0001
Acetophenone				
Dichloromethane	$y=1.152+1.092x$	0.848	0.921	<0.0001
Carbon tetrachloride				
1,2-Dichloroethane	$y=0.031+0.33x$	0.051	0.226	0.0913
Trichloroethylene	$y=-0.27+1.167x$	0.908	0.953	<0.0001
Tetrachloroethylene	$y=0.13+0.865x$	0.956	0.978	<0.0001
1,1,1-Trichloroethane	$y=0.447+6.94x$	0.805	0.897	<0.0001
1,4-Dichlorobenzene	$y=-6.797+1.459x$	0.971	0.985	<0.0001
1,2-Dichloropropane				
Chlorodibromomethane				
Chloroform				
Methylacetate				
Vinylacetate				
Butylformate				
Isobutylacetate				
Ethylacetate	$y=8.782+1.195x$	0.099	0.314	0.0398
Propylacetate				
Butylacetate	$y=0.854+0.738x$	0.926	0.962	<0.0001
Isopropylacetate				
2-Methoxyethylacetate				
2-Ethoxyethylacetate				
2-Ethylhexylacetate				
Linaloolacetate				
Methacrylic acid methyl ester				
TXIB				
Dimethyl phthalate				
Dibutyl phthalate	$y=0.956+1.325x$	0.284	0.533	<0.0001
1,4-Dioxane				
n-Methyl-2-pyrrolidone				
Caprolactam				
Indene				
2-Pentylfuran				
THF(Tetrahydrofuran)				
TVOC	$y=1308.861+1.862x$	0.241	0.491	<0.0001
TVOC(-ethanol)	$y=54.787+1.197x$	0.957	0.978	<0.0001

表8 両測定法におけるTVOCの測定結果

	TVOC		TVOC(エタノール削除)		TVOC (エタノール・テルペン類削除)		TVOC(H9,10)に測定した 化学物質(41)		TVOC(選定した化学物 質55)	
	溶媒	加熱	溶媒	加熱	溶媒	加熱	溶媒	加熱	溶媒	加熱
平均値	680.093	2410.776	590.992	763.057	493.479	456.100	491.856	601.127	514.076	643.577
中央値	383.328	1393.669	313.417	450.246	269.667	338.825	259.534	346.243	275.585	343.870
幾何平均	411.814	1318.964	325.777	471.754	261.370	329.131	263.202	352.520	281.959	386.476
最大値	4924.042	16771.706	4924.042	6258.170	4079.443	2062.079	4498.955	5763.811	4409.756	5854.132
最小値	14.594	42.329	14.594	14.572	14.207	13.094	14.342	12.270	14.296	12.750
n	60	60	60	60	60	60	60	60	60	60

図2 溶媒抽出法と加熱脱離法におけるTVOCのヒストグラム

溶媒抽出法

加熱脱離法

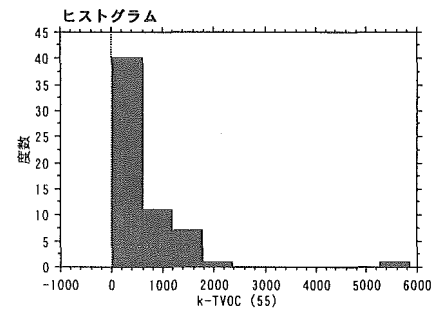
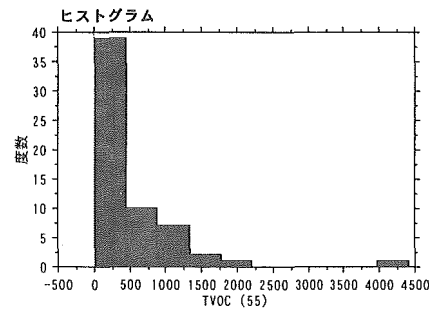
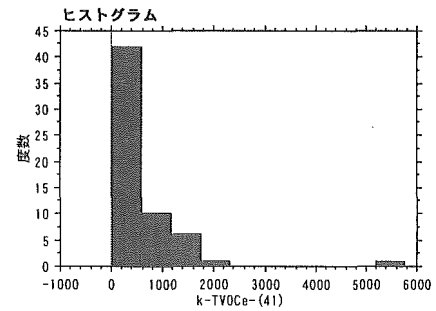
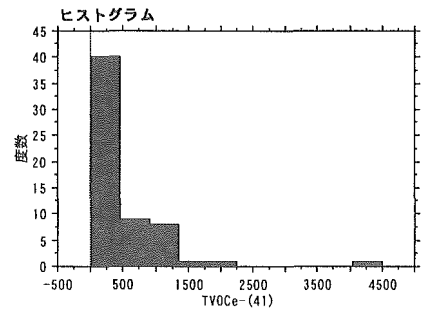
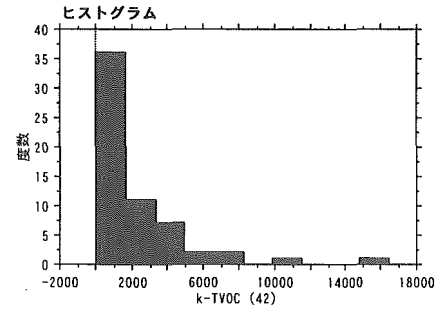
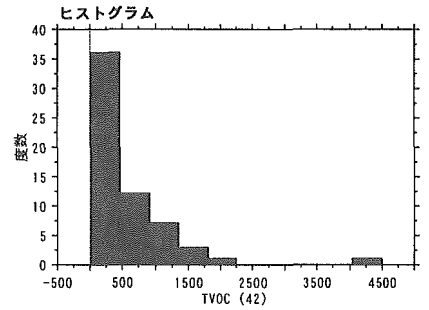
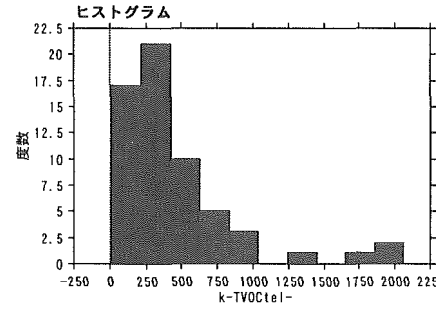
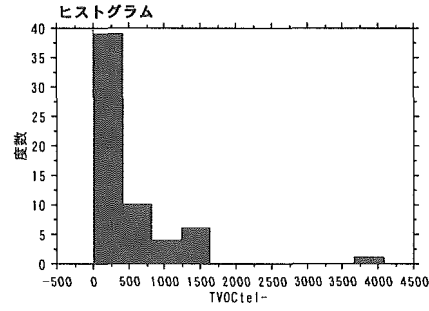
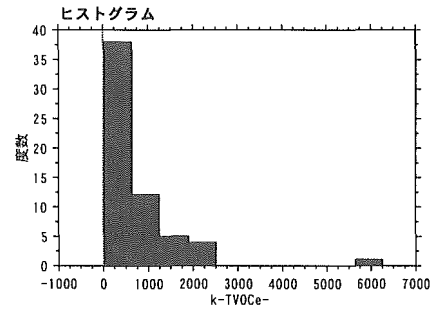
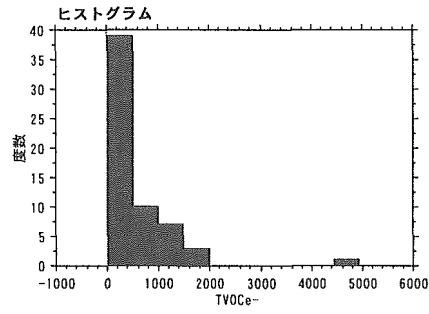
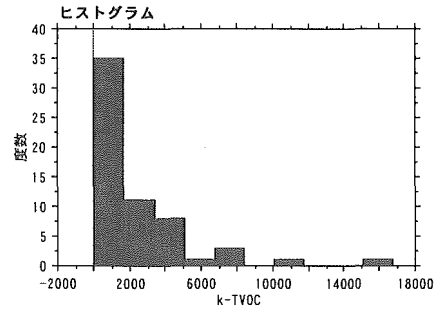
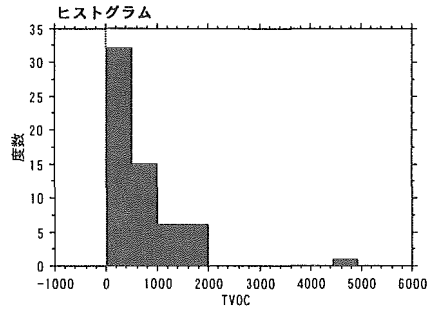


図3 溶媒抽出法と加熱脱離法におけるTVOCの対数変換のヒストグラム

溶媒抽出法

加熱脱離法

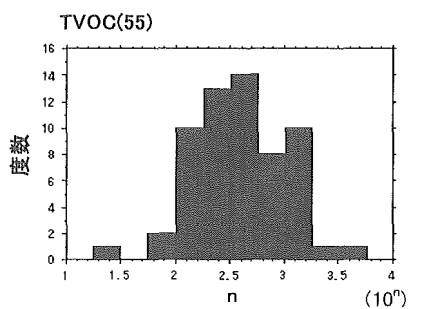
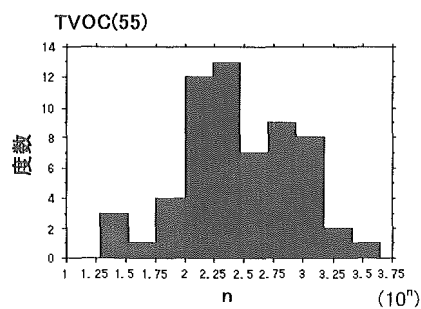
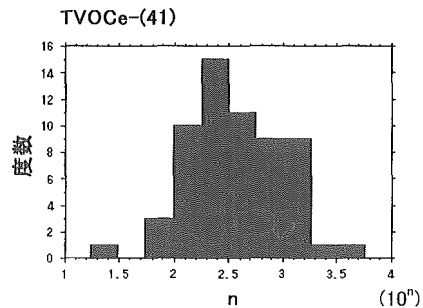
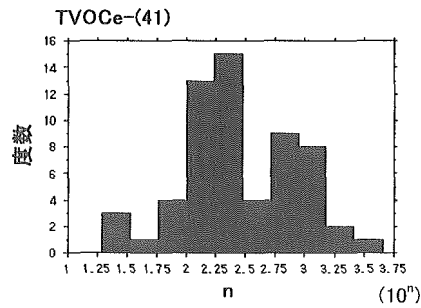
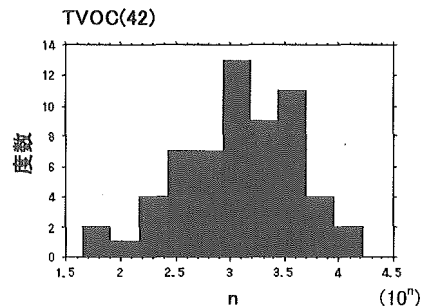
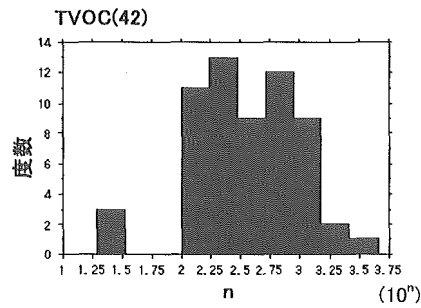
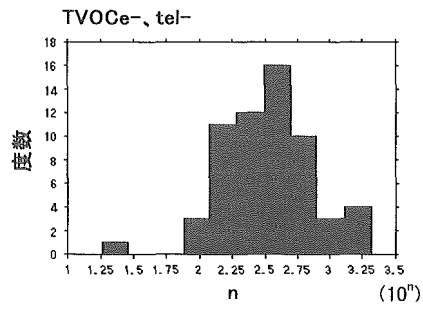
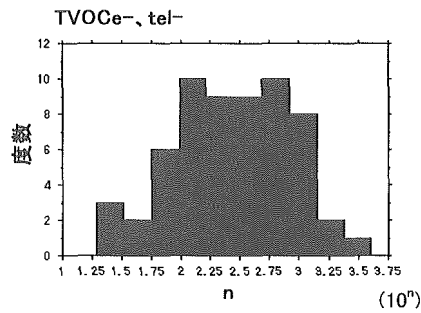
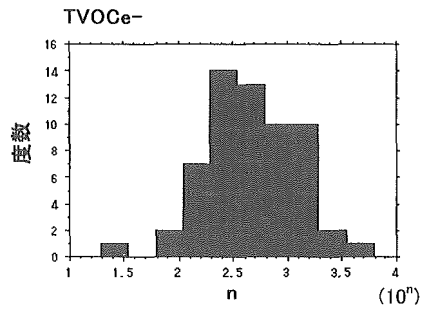
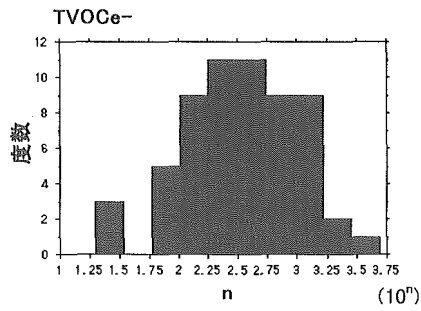
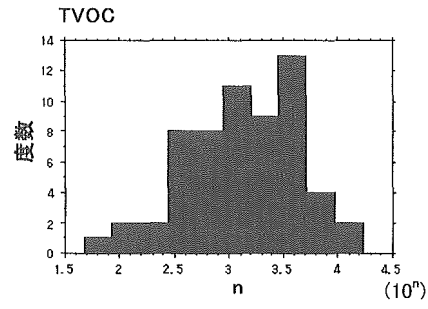
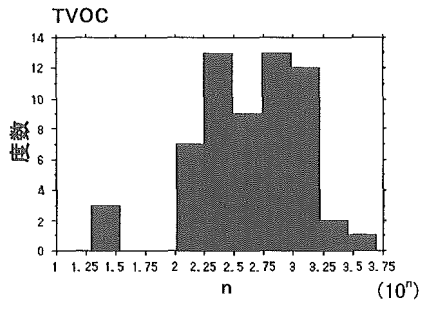


表9 溶媒抽出法と加熱脱離法における対数変換TVOC値のF検定t検定

	n		F検定				t検定				結果	
	溶媒	加熱	F値	10%	5%	1%	t値	10%	5%	1%		
実数	TVOC	60	60	0.069	×	×	×	-4.738	×	×	×	×
	TVOCe-	60	60	0.668	○	○	○	0.668	○	○	○	○
	TVOCtel-	60	60	2.296	×	×	×	0.345	○	○	○	×
	TVOC(42)	60	60	0.059	×	×	×	-4.719	×	×	×	×
	TVOCe-(41)	60	60	0.691	○	○	○	-0.789	○	○	○	○
実数	TVOC	60	60	0.069	×	×	×	-4.738	×	×	×	×
	TVOCe-	60	60	0.668	○	○	○	-1.108	○	○	○	○
	TVOCtel-	60	60	2.296	×	×	×	0.345	○	○	○	×
	TVOC(42)	60	60	0.028	×	×	×	-4.944	×	×	×	×
	TVOCe-(41)	60	60	0.347	×	×	×	-1.359	○	○	○	×
対数	TVOC	60	60	0.909	○	○	○	-6.541	×	×	×	×
	TVOCe-	60	60	1.300	○	○	○	-1.887	×	○	○	○
	TVOCtel-	60	60	1.000	○	○	○	0.000	○	○	○	○
	TVOC(42)	60	60	0.843	○	○	○	-6.866	×	×	×	×
	TVOCe-(41)	60	60	1.214	○	○	○	-1.479	○	○	○	○
対数	TVOC	60	60	0.909	○	○	○	-6.541	×	×	×	×
	TVOCe-	60	60	1.300	○	○	○	-1.887	×	○	○	○
	TVOCtel-	60	60	1.000	○	○	○	0.000	○	○	○	○
	TVOC(42)	60	60	0.677	○	○	○	-7.413	×	×	×	×
	TVOCe-(41)	60	60	1.085314	○	○	○	-1.888	×	○	○	○

TVOC: 全対象化学物質

TVOCe-: 全対象化学物質からエタノールを削除した

TVOCtel-: 全対象化学物質からエタノールとテルペン類を削除した

TVOC(42): 平成9、10年に実施した42化学物質(エタノール含)

TVOCe-(41): 平成9、10年に実施した42化学物質からエタノールを削除した。

TVOC(55): 解析結果により我が国で対象とすることが望まれる55化学物質

図4 溶媒抽出法と加熱脱離法におけるTVOCの相関性

実数

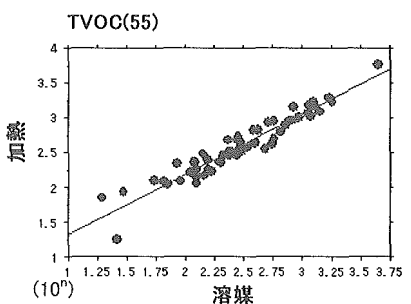
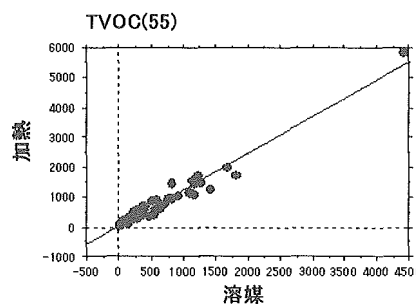
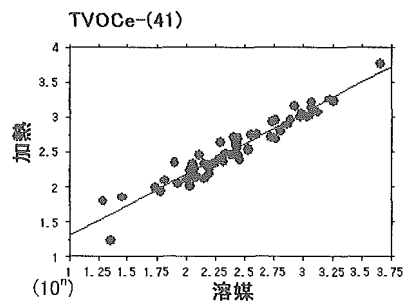
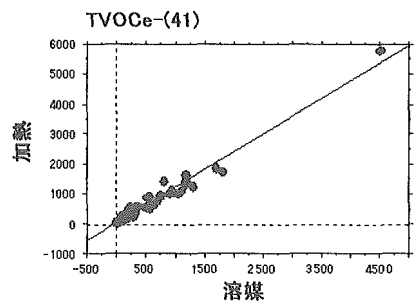
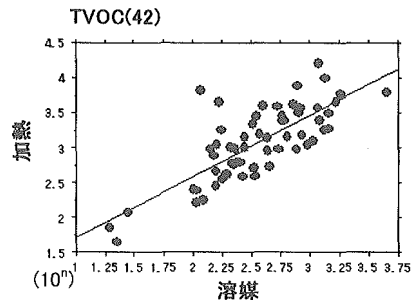
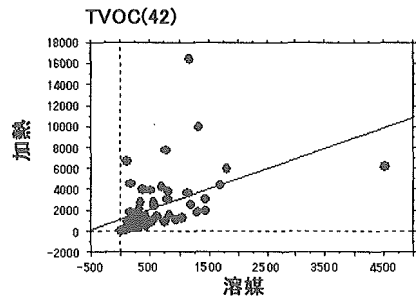
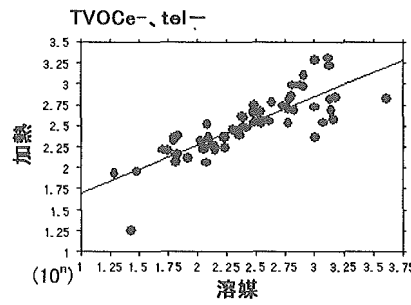
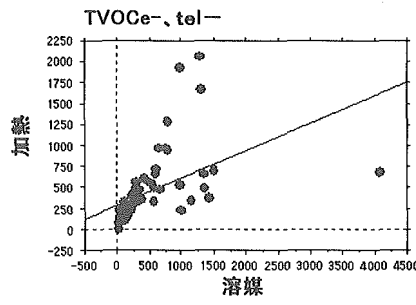
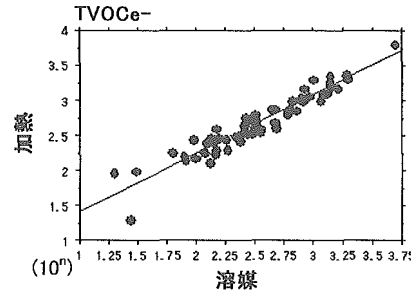
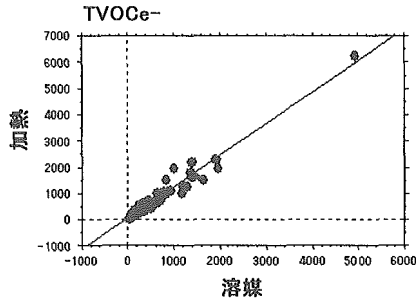
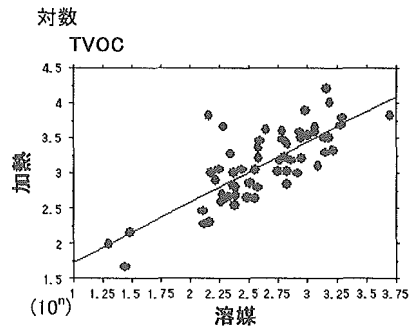
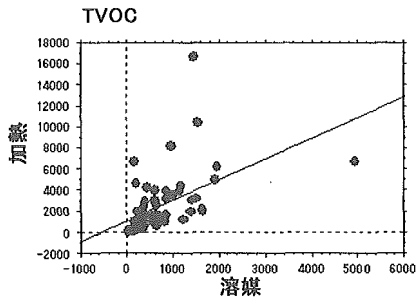


表10 両測定法における回帰直線式と相関係数

実数	化学物質	相関式	R ²	相関値	P値
	TVOC	y=1079.13+1.958x	0.266	0.516	<0.0001
	TVOC(-ethanol)	y=54.094+1.2x	0.954	0.977	<0.0001
	TVOC(-ethanol,terpene)	y=296.071+0.324x	0.240	0.490	<0.0001
	TVOC(42化学物質)	y=1103.212+1.972x	0.233	0.482	<0.0001
	TVOC(41化学物質)	y=16.359+1.189x	0.967	0.983	<0.0001
	TVOC(55化学物質)	y=13.823+1.225x	0.960	0.980	<0.0001

対数	化学物質	相関式	R ²	相関値	P値
	TVOC	y=0.851+0.886x	0.606	0.778	<0.0001
	TVOC(-ethanol)	y=0.558+0.841x	0.908	0.953	<0.0001
	TVOC(-ethanol,terpene)	y=1.121+0.578x	0.674	0.821	<0.0001
	TVOC(42化学物質)	y=0.812+0.888x	0.595	0.771	<0.0001
	TVOC(41化学物質)	y=0.414+0.88x	0.929	0.964	<0.0001
	TVOC(46化学物質)	y=0.47+0.863	0.912	0.955	<0.0001

表 1 1 HPLC の分析条件

Instrument	Shimadzu LC-10A
Column	Agilent ZORBAX Bonus-RP, 4.6mm 250 mm. 5 μ m
Oven Temp.	40 °C
Mobile Phase	a: Water/Acetonitrile 60/40 v/v b: Water/Acetonitrile 40/60 v/v
Gradient	100 % A for 8 min then a liner gradient from 100 % A to 100% B in 22 min
Flow Rate	1.5 ml/min
Injection Volume	20 μ l
Detection	absorbance at 360 nm

表 1 2 全国各地の住宅で測定したアルデヒド・ケトン類濃度の測定結果

	indoor air				outdoor air			
	mean	max.	min.	median	mean	max.	min.	median
formaldehyde	27.4	110.6	3.1	24.1	3.1	23.3	0.1	2.4
acetaldehyde	24.7	151.6	3.0	20.2	3.6	43.1	0.0	3.0
acetone	31.8	316.6	2.1	25.0	3.4	29.5	0.0	2.2
acrolein	0.3	3.0	0.0	0.2	0.0	1.4	0.0	0.0
propionaldehyde	1.9	10.4	0.0	1.8	0.3	13.5	0.0	0.2
crotonaldehyde	0.2	31.7	0.0	0.0	0.0	0.2	0.0	0.0
butanone	13.5	196.4	0.0	5.7	3.9	72.3	0.0	1.6
butyraldehyde	2.0	58.6	0.0	1.4	0.2	4.4	0.0	0.2
cyclohexanone	1.9	25.7	0.0	1.0	0.0	1.1	0.0	0.0
benzaldehyde	2.3	63.4	0.0	1.6	0.3	2.5	0.0	0.1
i-valeraldehyde	0.4	8.2	0.0	0.2	0.1	0.8	0.0	0.0
valeraldehyde	1.8	16.0	0.0	1.4	0.8	16.4	0.0	0.0
o-tolualdehyde	2.7	238.0	0.0	0.0	0.7	19.1	0.0	0.0
m,p-tolualdehyde	0.9	4.5	0.0	0.7	1.3	13.0	0.0	0.6
hexanal	7.7	81.5	0.0	5.6	0.4	14.2	0.0	0.1
2,5-DMBA	0.7	6.3	0.0	0.5	0.3	2.8	0.0	0.2
heptaldehyde	1.5	13.4	0.0	1.2	0.2	9.6	0.0	0.0
octaldehyde	1.6	20.0	0.0	1.2	0.0	0.7	0.0	0.0
nonanal	4.8	16.2	0.0	4.3	0.4	2.8	0.0	0.3
decanal	1.2	6.1	0.0	0.9	0.1	7.4	0.0	0.0

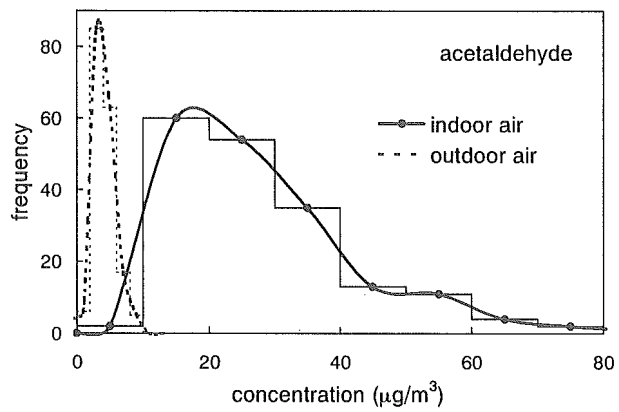
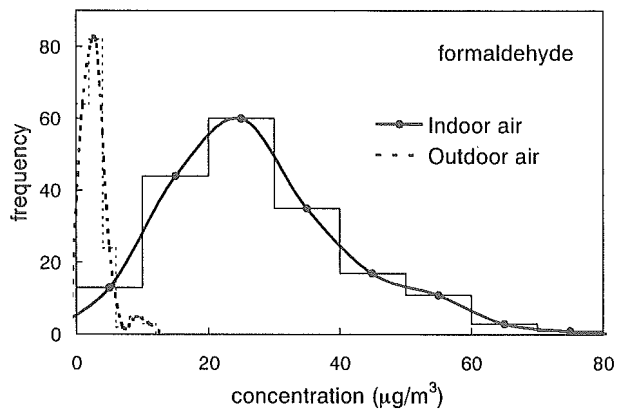


図5 室内と室外空气中のホルムアルデヒド及びアセトアルデヒドの濃度分布

表13 室内及び室外空气中のアルデヒド・ケトン類についての相関関係

Indoor Air	form aldehyde	acet aldehyde	acetone	acrolein	propion aldehyde	croton aldehyde	butanone	butyr aldehyde	cyclo hexanone	benz aldehyde	i-valer aldehyde	valer aldehyde	o-tolu aldehyde	m,p-tolu aldehyde	hexanal	2,5-DMBA	hept aldehyde	oct aldehyde	nonanal	decanal
formaldehyde	1.00																			
acetaldehyde	0.41	1.00																		
acetone	0.37	0.63	1.00																	
acrolein	0.38	0.42	0.27	1.00																
propionaldehyde	0.31	0.28	0.29	0.50	1.00															
crotonaldehyde	0.09	0.48	0.14	0.04	-0.11	1.00														
2-butanone	0.12	0.58	0.51	0.16	-0.04	0.55	1.00													
butyraldehyde	0.17	0.58	0.26	0.15	-0.04	0.96	0.59	1.00												
cyclohexanone	0.23	0.35	0.47	0.14	0.17	0.09	0.45	0.15	1.00											
i-valeraldehyde	0.10	0.14	0.22	0.28	0.05	0.02	0.25	0.12	0.08	1.00										
benzaldehyde	0.10	0.26	0.25	0.08	0.06	0.24	0.23	0.24	0.41	0.14	1.00									
valeraldehyde	0.23	0.36	0.42	0.39	0.22	0.03	0.40	0.17	0.34	0.32	0.14	1.00								
o-tolualdehyde	0.07	0.47	0.14	0.04	-0.08	0.98	0.56	0.95	0.10	0.02	0.24	0.06	1.00							
m,p-tolualdehyde	-0.02	-0.04	-0.03	0.03	-0.04	0.05	-0.08	0.05	-0.01	-0.03	0.00	-0.03	0.02	1.00						
hexanal	0.26	0.40	0.43	0.35	0.20	0.05	0.42	0.19	0.32	0.30	0.05	0.95	0.08	-0.07	1.00					
2,5-DMBA	0.24	0.30	0.09	0.23	0.14	0.07	0.22	0.13	0.14	0.09	0.15	0.14	0.09	-0.09	0.15	1.00				
heptaldehyde	0.29	0.41	0.31	0.46	0.20	0.10	0.32	0.24	0.19	0.24	0.04	0.83	0.12	-0.06	0.83	0.25	1.00			
octaldehyde	0.21	0.35	0.30	0.39	0.11	0.02	0.34	0.16	0.21	0.18	0.05	0.85	0.04	0.00	0.88	0.19	0.88	1.00		
nonanal	0.33	0.34	0.29	0.35	0.20	0.22	0.19	0.34	0.14	0.21	0.09	0.56	0.22	-0.02	0.63	0.07	0.65	0.65	1.00	
decanal	0.22	0.19	0.07	0.14	0.06	0.02	-0.03	0.10	0.06	0.07	0.06	0.20	0.01	0.03	0.25	0.16	0.42	0.43	0.61	1.00

Outdoor Air	form aldehyde	acet aldehyde	acetone	acrolein	propion aldehyde	croton aldehyde	butanone	butyr aldehyde	cyclo hexanone	benz aldehyde	i-valer aldehyde	valer aldehyde	o-tolu aldehyde	m,p-tolu aldehyde	hexanal	2,5-DMBA	hept aldehyde	oct aldehyde	nonanal	decanal	
formaldehyde	1.00																				
acetaldehyde	0.54	1.00																			
acetone	0.40	0.44	1.00																		
acrolein	0.14	0.18	0.34	1.00																	
propionaldehyde	0.20	0.19	0.36	0.84	1.00																
crotonaldehyde	-0.09	0.11	-0.13	-0.04	-0.07	1.00															
2-butanone	0.36	0.26	0.31	0.25	0.18	-0.06	1.00														
butyraldehyde	0.15	0.10	0.21	0.42	0.41	0.00	0.11	1.00													
cyclohexanone	0.03	-0.07	-0.03	-0.03	-0.03	0.12	-0.04	0.00	1.00												
benzaldehyde	0.20	0.13	0.17	0.12	0.00	0.00	0.39	0.23	-0.20	1.00											
i-valeraldehyde	0.03	-0.08	0.03	-0.04	0.00	-0.09	0.24	-0.10	-0.06	0.14	1.00										
valeraldehyde	-0.12	-0.05	-0.21	-0.06	-0.10	0.54	-0.09	-0.06	0.16	0.04	-0.13	1.00									
o-tolualdehyde	-0.01	0.07	0.02	0.06	0.07	-0.05	0.07	0.12	-0.07	0.09	-0.02	-0.08	1.00								
m,p-tolualdehyde	0.01	0.13	0.01	-0.02	-0.02	0.20	-0.05	0.02	0.20	-0.02	-0.13	0.06	-0.07	1.00							
hexanal	0.23	0.05	0.04	0.03	0.07	-0.04	0.00	0.05	0.03	-0.02	-0.07	-0.05	-0.08	-0.05	1.00						
2,5-DMBA	0.38	0.40	0.47	0.49	0.52	-0.02	0.48	0.15	-0.02	0.26	0.16	0.01	0.11	-0.05	-0.07	1.00					
heptaldehyde	0.41	0.02	0.01	0.07	0.07	-0.05	0.02	0.05	0.15	-0.05	-0.04	-0.07	-0.04	-0.01	0.18	0.02	1.00				
octaldehyde	0.13	0.10	0.24	0.59	0.64	0.06	0.01	0.42	0.04	0.21	-0.09	-0.01	0.11	-0.01	0.06	0.35	0.06	1.00			
nonanal	0.12	0.06	0.33	0.32	0.32	0.08	-0.01	0.32	0.08	0.26	-0.10	-0.04	-0.01	0.06	0.12	0.15	-0.02	0.67	1.00		
decanal	0.03	0.03	0.08	0.11	0.12	-0.01	-0.03	0.06	-0.05	0.11	-0.06	-0.03	-0.02	-0.04	0.02	0.14	0.00	0.26	0.26	1.00	