

Date : April 21, 2016

SAMPLE IDENTIFICATION

Internal code : 16D08-ALK2-1-LC

Customer identification : B-PIMACAN03QC

Type : Essential oil

Source : *Picea mariana*

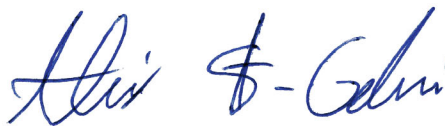
ANALYSIS

Method : PC-PA-001-15E06, "Analysis of the composition of a liquid essential oil by GC-FID" (in French).

Analyst : Alexis St-Gelais, M. Sc., chimiste

Analysis date : 2016-04-10

Checked and approved by :



Alexis St-Gelais, M. Sc., chimiste 2013-174

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IDENTIFIED COMPOUNDS

Identification	Column: BP5			Column: WAX			Molecular Class
	R.T.	R.I.	%	%	R.I.	R.T.	
Hexanal	1.56	802	0.01				Aliphatic aldehyde
<i>cis</i> -Hex-3-en-1-ol	2.30	862	0.02	0.01	1333	4.88	Aliphatic alcohol
Santene	2.42	873	3.53	3.58	909	0.74	Normonoterpene
Hexanol	2.53	882	0.02	0.02	1310	4.53	Aliphatic alcohol
Tricyclene	3.00	915	1.98	1.94	932	0.83	Monoterpene
α -Thujene	3.09	921	0.22	17.62	962	0.95††	Monoterpene
α -Pinene	3.22	929	17.48	[17.62]	958	0.93††	Monoterpene
Camphene	3.50*	946	17.42	17.28	1010	1.18	Monoterpene
α -Fenchene	3.50*	946	[17.42]	0.06	998	1.10	Monoterpene
Thuja-2,4(10)-diene	3.55	949	0.04	0.17	1061	1.58*	Monoterpene
Sabinene	3.88	970	0.19	[0.17]	1061	1.58*	Monoterpene
β -Pinene	3.95	974	5.23	5.20	1046	1.46	Monoterpene
Myrcene	4.23	991	3.75	3.65	1121	2.10	Monoterpene
Δ 3-Carene	4.52*	1008	9.65	9.35	1099	1.88	Monoterpene
α -Phellandrene	4.52*	1008	[9.65]	0.35	1112	2.01	Monoterpene
<i>cis</i> -Hex-3-en-1-yl acetate	4.58	1011	0.03	0.05	1273	4.03	Aliphatic ester
α -Terpinene	4.67	1017	0.30	0.30	1126	2.16	Monoterpene
para-Cymene	4.85	1027	0.20	0.22	1213	3.19	Monoterpene
Limonene	4.90†	1030	4.57	3.21	1144	2.38	Monoterpene
β -Phellandrene	4.93†	1031	[4.57]	1.74	1150	2.45*	Monoterpene
1,8-Cineole	4.96	1033	0.51	[1.74]	1150	2.45*	Monoterp. ether
<i>cis</i> - β -Ocimene	5.07	1039	0.02	0.34	1192	2.94*	Monoterpene
<i>trans</i> - β -Ocimene	5.25	1049	0.02	0.01	1208	3.11	Monoterpene
γ -Terpinene	5.43	1059	0.31	[0.34]	1192	2.94*	Monoterpene
<i>P. mariana</i> biomarker	5.73	1076	0.04	0.03	1455	6.85	Monoterp. alcohol
Isoterpinolene	5.82	1081	0.04	0.03	1223	3.33	Monoterpene
Terpinolene	5.90	1086	1.21	1.17	1228	3.40	Monoterpene
para-Cymenene	6.07	1095	0.10	0.08	1374	5.47	Monoterpene
γ -Campholenal	6.13	1099	0.06				Monoterp. aldehyde
Linalool	6.30	1107	0.21	0.21	1505	7.80	Monoterp. alcohol
endo-Fenchol	6.67	1121	0.04	0.06	1525	8.27	Monoterp. alcohol
α -Campholenal	6.84	1127	0.10				Monoterp. aldehyde
<i>trans</i> -Pinocarveol	7.11	1138	0.09	0.24	1575	9.79*	Monoterp. alcohol
Camphor	7.29	1145	0.06	0.06	1428	6.33	Monoterp. ketone
Camphene hydrate	7.48	1153	0.35	0.42	1528	8.38*	Monoterp. alcohol
Isoborneol	7.72	1162	0.08	0.09	1591	10.31	Monoterp. alcohol
Borneol	8.00	1173	0.70	0.80	1627	11.52*	Monoterp. alcohol

Terpinen-4-ol	8.19	1181	0.34	0.34	1536	8.62	Monoterp. alcohol
Cryptone	8.56	1195	0.02	0.11	1572	9.71	Monoterp. ketone
α -Terpineol	8.77	1203	0.61	0.64	1632	11.78*	Monoterp. alcohol
Verbenone	9.10	1211	0.02	0.03	1603	10.66	Monoterp. ketone
endo-Fenchyl acetate	9.27	1215	0.30	0.28	1409	5.98*	Sesquiterpene
Thymol methyl ether	9.69	1225	0.04	0.09	1530	8.42	Monoterp. ether
Pulegone	10.10	1234	0.04	0.04	1563	9.47	Monoterp. ketone
cis-Verbenyl acetate	11.88	1276	0.15				Monoterp. ester
Bornyl acetate	12.25*	1285	24.78	25.27	1518	8.09*	Monoterp. ester
Isobornyl acetate	12.25*	1285	[24.78]	[0.47]	1518	8.10*	Monoterp. ester
trans-Verbenyl acetate	12.25*	1285	[24.78]				Monoterp. ester
trans-Pinocarvyl acetate	12.65	1294	0.16	0.13	1542	8.81	Monoterp. ester
<i>P. mariana</i> biomarker	12.71	1296	0.12	[0.24]	1575	9.79*	Monoterp. ester
α -Cubebene	14.86*	1333	0.10	[0.28]	1409	5.98*	Sesquiterpene
exo-2-Hydroxycineole acetate	14.86*	1333	[0.10]				Monoterp. ester
α -Terpinyl acetate	15.54	1344	0.08	0.21	1617	11.10*	Monoterp. ester
α -Ylangene	16.14	1354	0.10	0.08	1420	6.18	Sesquiterpene
α -Copaene	16.55	1360	0.03	0.02	1432	6.40	Sesquiterpene
β -Elemene	17.69	1378	0.06	[0.42]	1528	8.38*	Sesquiterpene
Geranyl acetate	18.13	1385	0.18	0.17	1695	14.63*	Monoterp. ester
Longifolene	18.35	1389	0.12	0.09	1493	7.57	Sesquiterpene
β -Caryophyllene	19.25	1403	0.30	0.21	1526	8.30	Sesquiterpene
cis-Muurolo-3,5-diene	21.54	1431	0.03	0.04	1556	9.24	Sesquiterpene
α -Humulene	21.90	1436	0.07	0.12	1587	10.17*	Sesquiterpene
trans-Cadina-1(6),4-diene	22.89	1448	0.03	[0.12]	1587	10.17*	Sesquiterpene
γ -Muurolole	23.55	1456	0.07	0.08	1611	10.88	Sesquiterpene
Germacrene D	23.89	1460	0.12	[0.21]	1617	11.10*	Sesquiterpene
cis-Muurolo-4(14),5-diene	24.02	1462	0.07	0.07	1623	11.34	Sesquiterpene
β -Selinene	24.76	1471	0.03	[0.80]	1627	11.52*	Sesquiterpene
α -Selinene	25.21	1476	0.02	[0.64]	1632	11.78*	Sesquiterpene
α -Muurolole	25.99	1486	0.25	0.21	1649	12.53	Sesquiterpene
γ -Cadinene	26.97	1498	0.29	0.30	1671	13.52	Sesquiterpene
δ -Cadinene	27.66	1506	1.11	1.11	1678	13.81	Sesquiterpene
trans-Cadina-1,4-diene	27.93*	1510	0.08	[0.17]	1695	14.63*	Sesquiterpene
trans-Calamenene	27.93*	1510	[0.08]	0.03	1737	16.77	Sesquiterpene
α -Cadinene	29.02	1524	0.07	0.04	1713	15.37	Sesquiterpene
trans- α -Bisabolene	30.22	1540	0.15	0.12	1711	15.30	Sesquiterpene
τ -Cadinol	36.41	1635	0.12	0.12	2076	36.82	Sesquiterp. alcohol
τ -Muurolol	36.53	1638	0.10	0.11	2091	37.36	Sesquiterp. alcohol
α -Muurolol	36.68	1641	0.03	0.03	2107	37.89	Sesquiterp. alcohol
α -Cadinol	37.00	1648	0.21	0.22	2129	38.66	Sesquiterp. alcohol
Oplopanone	39.34	1703	0.02	0.03	2356	44.30	Sesquiterp. alcohol
Manool	48.56	2036	0.01	0.02	2555	48.31	Diterp. alcohol

Essential oil, *Picea mariana*
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<i>cis</i> -Abienol	50.76	2132	0.02	0.02	2676	50.58	Diterp. alcohol
Total identified			99.03%	98.67%			

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

†: Peaks apexes were resolved, but peaks overlapped and were summed for analysis

Note: no correction factor was applied

OTHER DATA

Physical aspect : Clear liquid

Refractive index : 1.4688 ± 0.0003 (20 °C)

CONCLUSION

No adulterant, contaminant or diluent were detected using this method.

