A simplified sample preparation technique for the analysis of odors coming from shirts using MonoTrap and TD-GC-MS-Olfactometory

T. Manami[1], E. Kaal[2], A. Sato[1] and K. Sotomaru[1]

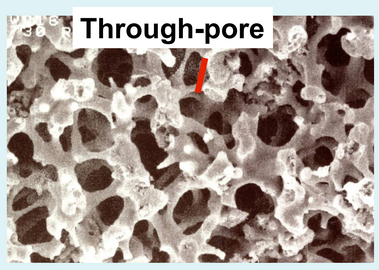
1. Department of R&D, GL Sciences, 273-2, Sayamagahara, Iruma, Saitama 358-0032, Japan (Takeda@gls.co.jp)
2. ATAS GL International, P.O. Box 17, 5500 AA Eindhoven, The Netherlands

Introduction:

After wearing a shirt for a day it starts smelling. This is a consequence of that the perfumed fabric softeners are disappearing during the day and the concentration of our body odors in the shirt increases. To study this effect, we wanted to develop a new method for the analysis of these odors. MonoTrap is an excellent tool to adsorb the volatile components (polar, hydrophilic, hydrophobic, nitrogen component, organosulfur components etc.) and targets are extensive.

What is MonoTrap: *M*onolithic *M*aterial *S*orptive *E*xtraction (MMSE)

MonoTrap is made of pure silica and it is having a porous monolithic structure (including meso-pores) resulting in a large surface area. When the sample passes the pores of the silica monolithic structure, compounds are trapped by the ODS groups (which are bonded to the surface) or they are trapped by the activated carbon (or graphite carbon) present inside and outside the structure.



MonoTrap-TD and it's monolithic structure.

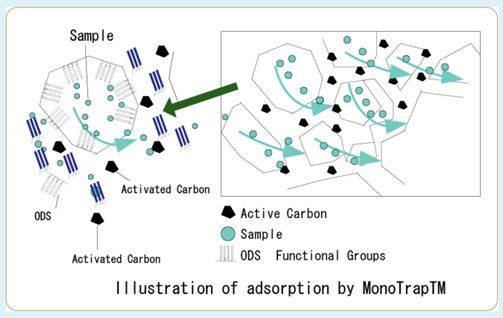
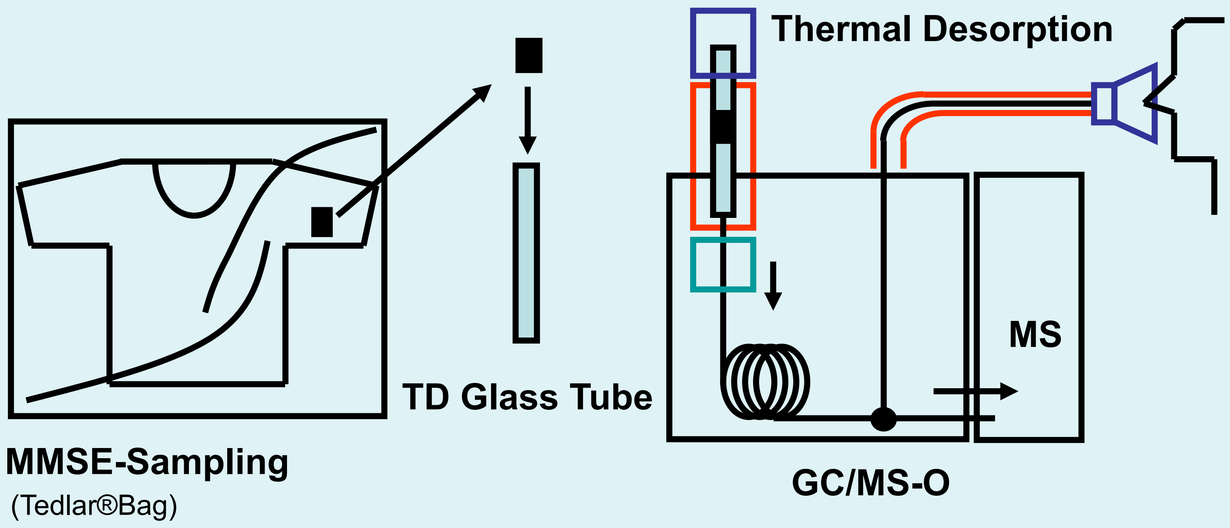


Illustration of adsorption by MonoTrapTM

*T*hermal *D*esorption (TD)

Samples extracted by MonoTrap-TD are desorbed by Thermal desorption technique. The desorption gas enters the through-pores and come in contact with extracted samples by MonoTrap-TD very efficiently. Therefore, a high desorption temperature is not needed.

Experimental:

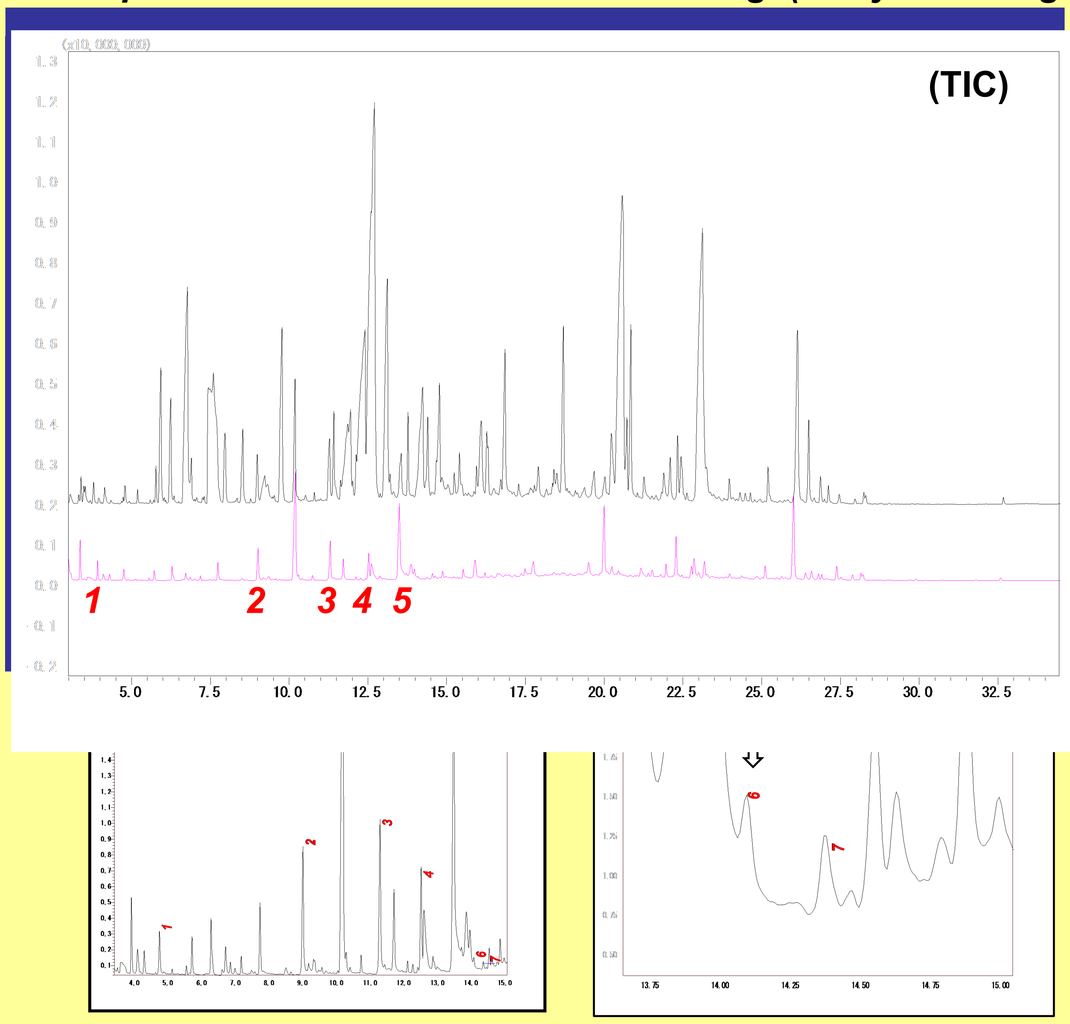


Instrumentation and conditions:

TDex Ⅱ Desorb:	temp 200℃, time 5 min, rate 10 ℃ /sec
	split 1:5 (desorb flow 5 mL/min, split less)
Injector temperature :	250 ℃
Cryo-trap:	-150 ℃ to 250 ℃ (rate 50 ℃ /sec)
Flow :	1.6 mL/min
GC/MS:	GC-2010 and QP2010$^+$ (SHIMADZU)
Oven program:	40℃(5min)→6℃/min→250℃(10min)
Column:	InertCap Pure-WAX (0.25mm×30M 0.25μm)
Ion source :	200 ℃
Inter face:	250 ℃
Mass range:	28.8-600 amu
Phaser:	
Line Temp:	300 ℃
Make up gas:	5mL (He)

Results

1. Comparison with before and after wearing. (Body odor origin)



2. Lingering scent of fabric softener*. (fabric softener odor origin)*

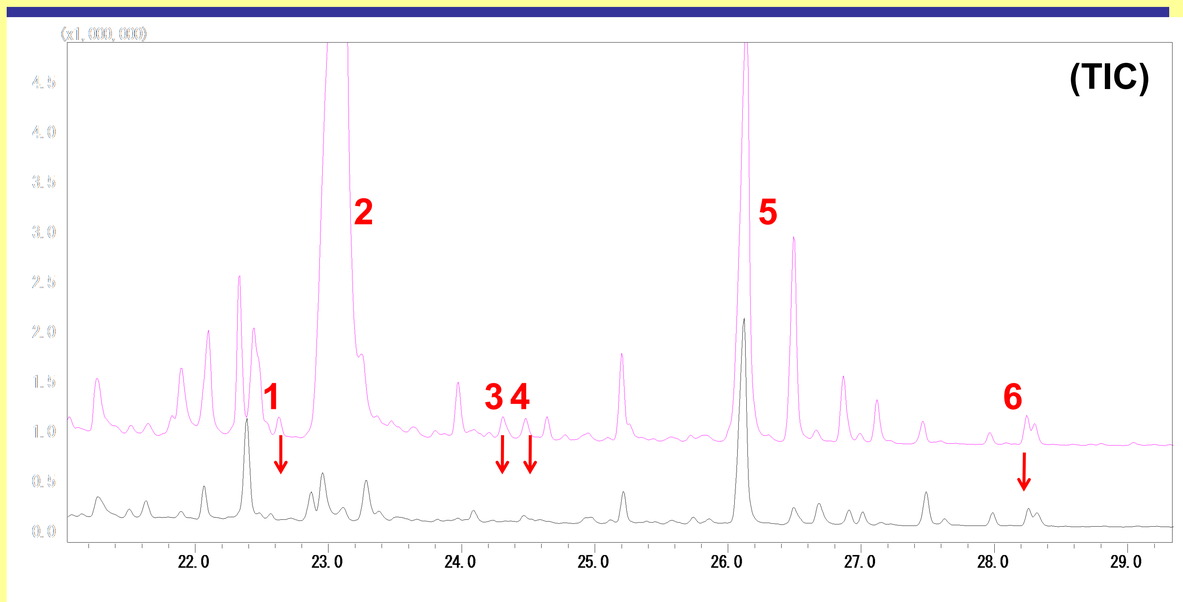


Table 1: Examples of odor compounds

Peak No.	Compound	Aroma charactor	Aroma Intensity*
1	Hexanal	smelling of grass	High
2	Octanal	pungent	High
3	Nonanal	Sour	High
4	Decanal	Dog food	High
5	Dodecanal	Sour	High
6	trans-2-Nonenal	---	
7	Propanoic acid	---	

***L=Low, M=Middle, H=High**

Peak No.	Compound	Aroma caharactor	Sensitivity ratio	Aroma Intensity*
1	γ-Amylbutyrolactone	Heavy sweetness.	0%	M-M
2	Lilial	Detergent Soop	3%	H-H
3	γ-Decalactone	Sweet Peach	2%	M-M
4	Ambrox	Fresh floral.	28%	M-L
5	Muskalactone	Sweet Stach	32%	H-L
6	5-Cyclohexadecenone	Citras	64%	H-L

Conclusion:

1. **Using MMSE, it was simple to confirm that the fabric softener scent component was decreasing after wear.**
2. **Odor compounds were adsorbed effectively to the MonoTrap .**
3. **By using MonoTrap, sensory analysis was also able to do stinking thing quality by enough sensitivity.**

References:

1. Evaluation of Leaf-Derived Extracts as an Environmentally Sustainable Source of Essential Oils by Using Gas Chromatography-Mass Spectrometry and Enantioselective Gas Chromatography-Olfactometry. Barbara d'Acampora Zellner, Maria Lo Presti, Lauro Euclides Soares Barata, Paola Dugo, Giovanni Dugo and Luigi Mondello. Anal. Chem. 2006, 78, 883-890

2. Odour fingerprint acquisition by means of comprehensive two-dimensional gas chromatographyolfactometry and comprehensive two-dimensional gas chromatography/mass spectrometry. Barbara d'Acampor Zellner, Paola Dugo, Giovanni Dugo, Luigi Mondello. Journal of Chromatography A, 1141 (2007) 279–286