

# Easy and Fast Enrichment of the Aroma Components of Cheese by MMSE

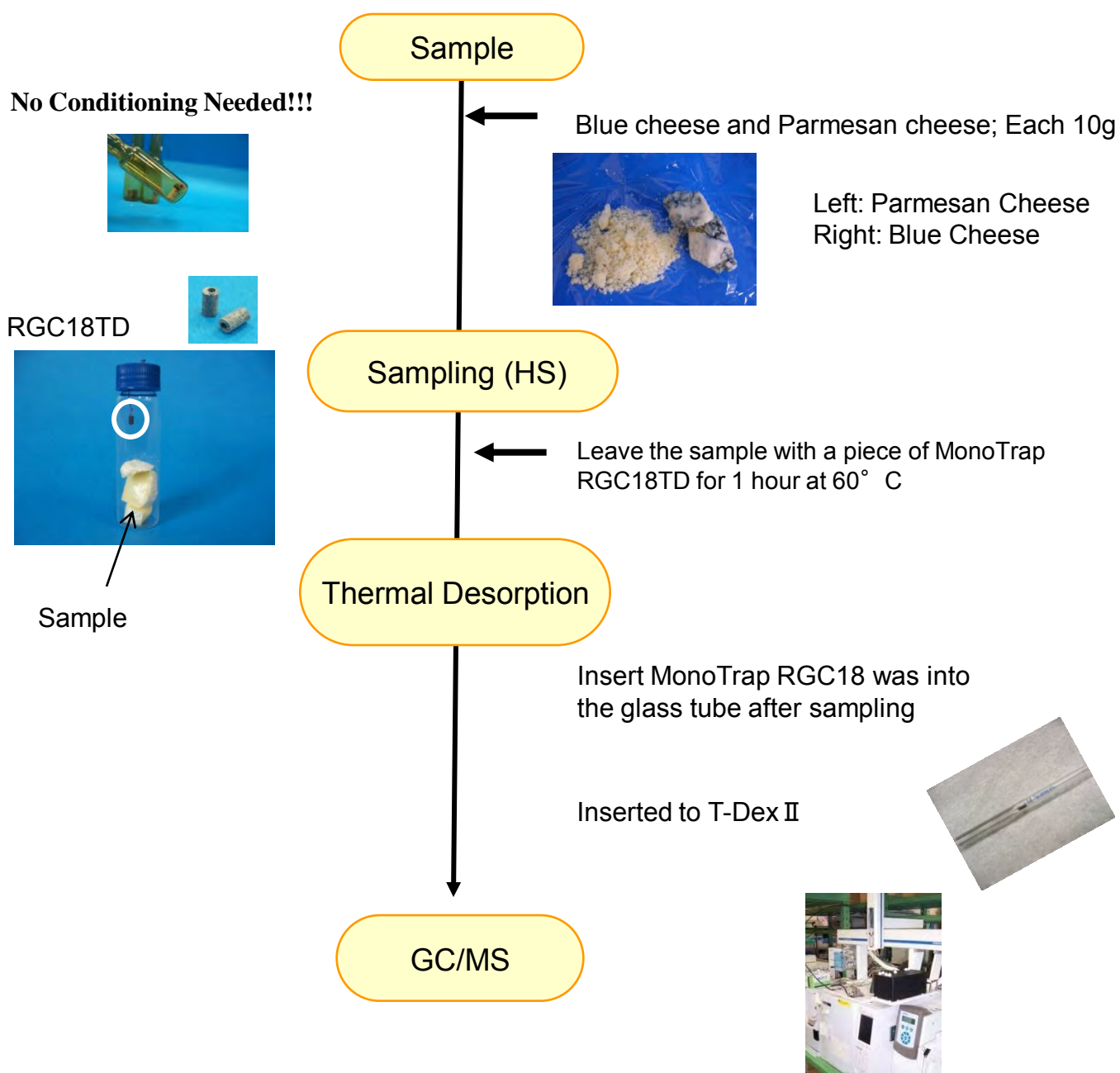
## What is MMSE?

Monolithic Material Sorption Extraction (MMSE) is a novel approach for sample adsorption and extraction using monolithic hybrid adsorbent - MonoTrap. MMSE has advantages such as effective pretreatment with simple operation and high-efficiency adsorption capacity. In addition, importantly, MMSE does not require conditioning before use.

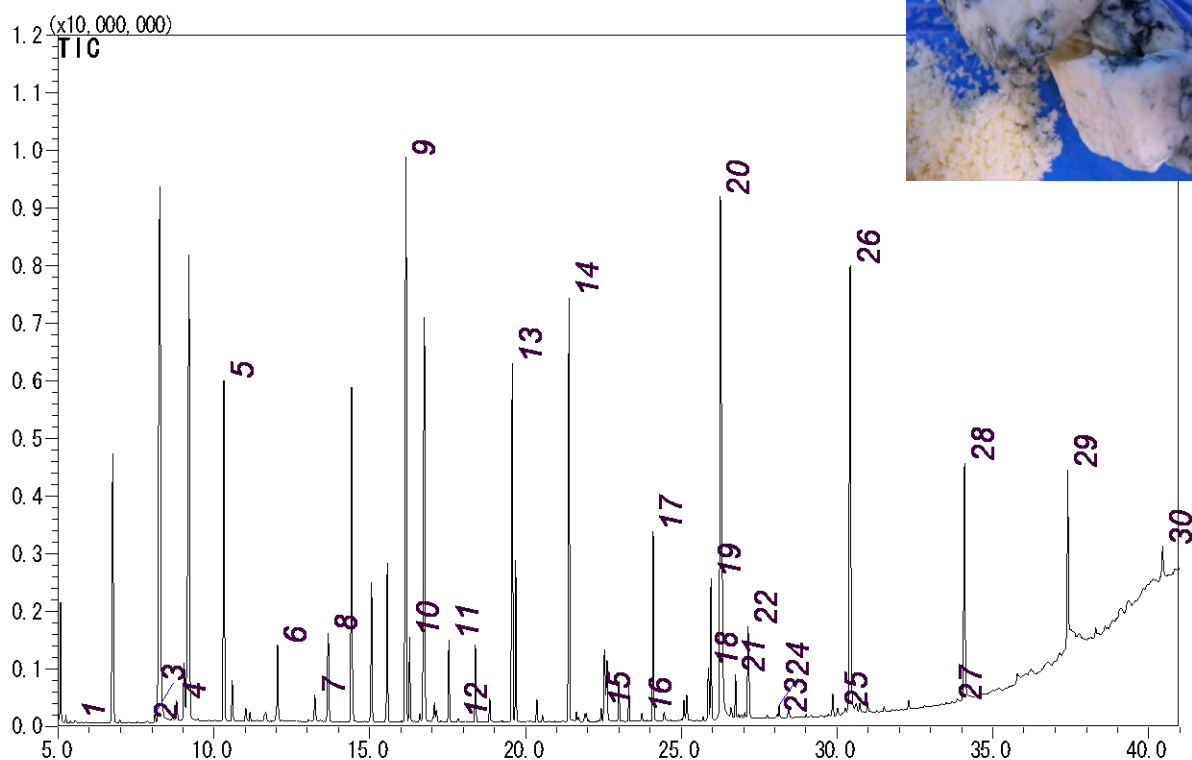
## What is MonoTrap?

MonoTrap is a state-of-the-art silica monolithic and hybrid adsorbent having a large surface area and properties based on silica, activated carbon (graphite carbon for MonoTrap TD) and Octadecyl functional group.

## Sample Preparation Procedure by MMSE-TD



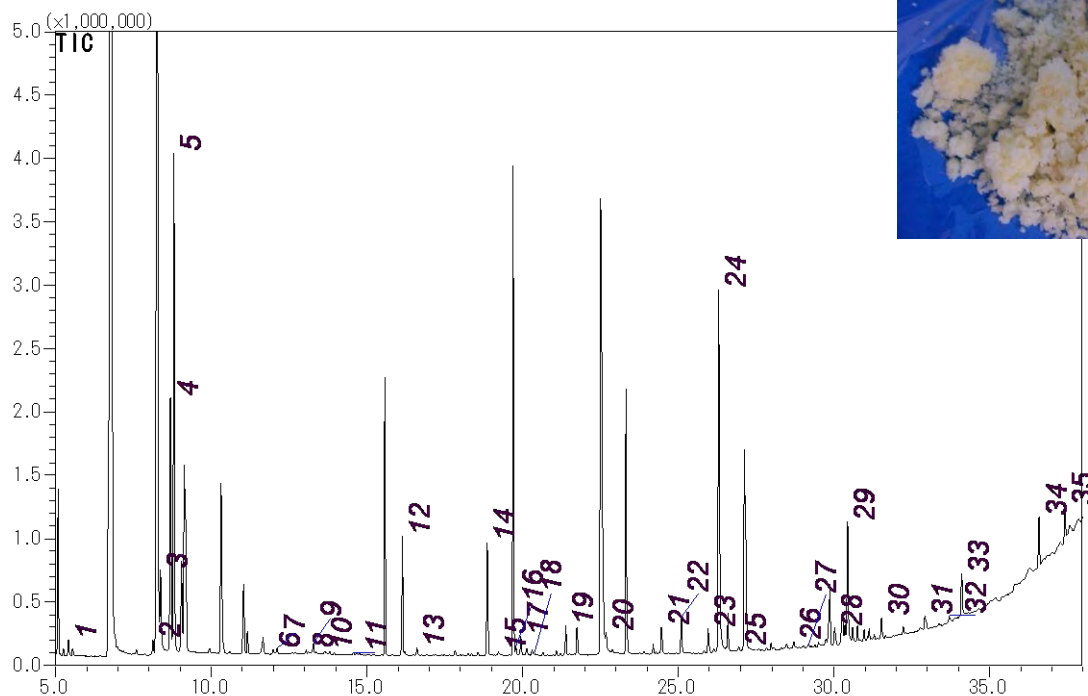
Flavor components of **Blue Cheese**



- |    |                             |    |                             |
|----|-----------------------------|----|-----------------------------|
| 1  | Acetaldehyde                | 16 | 2-Decanone                  |
| 2  | Butanal                     | 17 | 2-Nonanol                   |
| 3  | Ethyl Acetate               | 18 | Decanoic acid, methyl ester |
| 4  | Isovaleraldehyde            | 19 | 2-Undecanone                |
| 5  | 2-Pentanone                 | 20 | Butanoic acid               |
| 6  | Ethyl butyrate              | 21 | Decanoic acid, ethyl ester  |
| 7  | 2-Hexanone                  | 22 | Butanoic acid, 3-methyl-    |
| 8  | Isobutyl alcohol            | 23 | $\gamma$ -Caprolactone      |
| 9  | 2-Heptanone                 | 24 | 2-Undecanol                 |
| 10 | Hexanoic acid, methyl ester | 25 | 2-Tridecanone               |
| 11 | Hexanoic acid, ethyl ester  | 26 | Hexanoic acid               |
| 12 | 1-Pentanol                  | 27 | 2-Pentadecanone             |
| 13 | 2-Heptanol                  | 28 | Octanoic Acid               |
| 14 | 2-Nonanone                  | 29 | n-Decanoic acid             |
| 15 | Octanoic acid, ethyl ester  | 30 | Dodecanoic acid             |

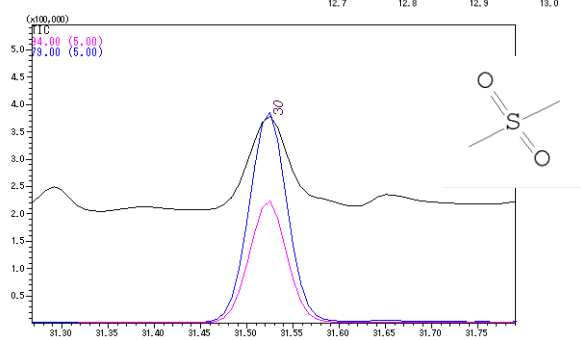
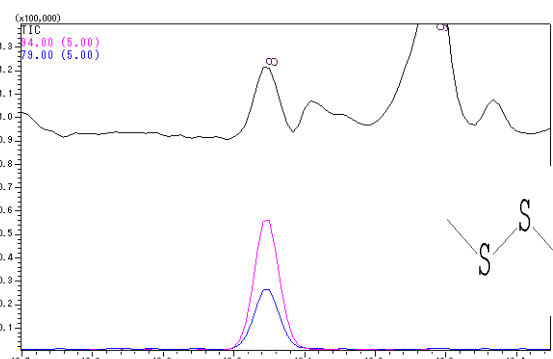
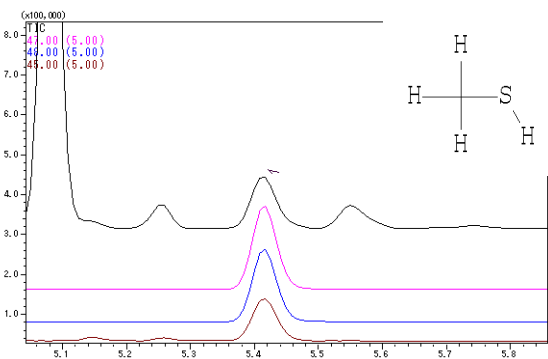
• Compound are identified with spectral libraries.

Flavor components of **Parmesan Cheese**

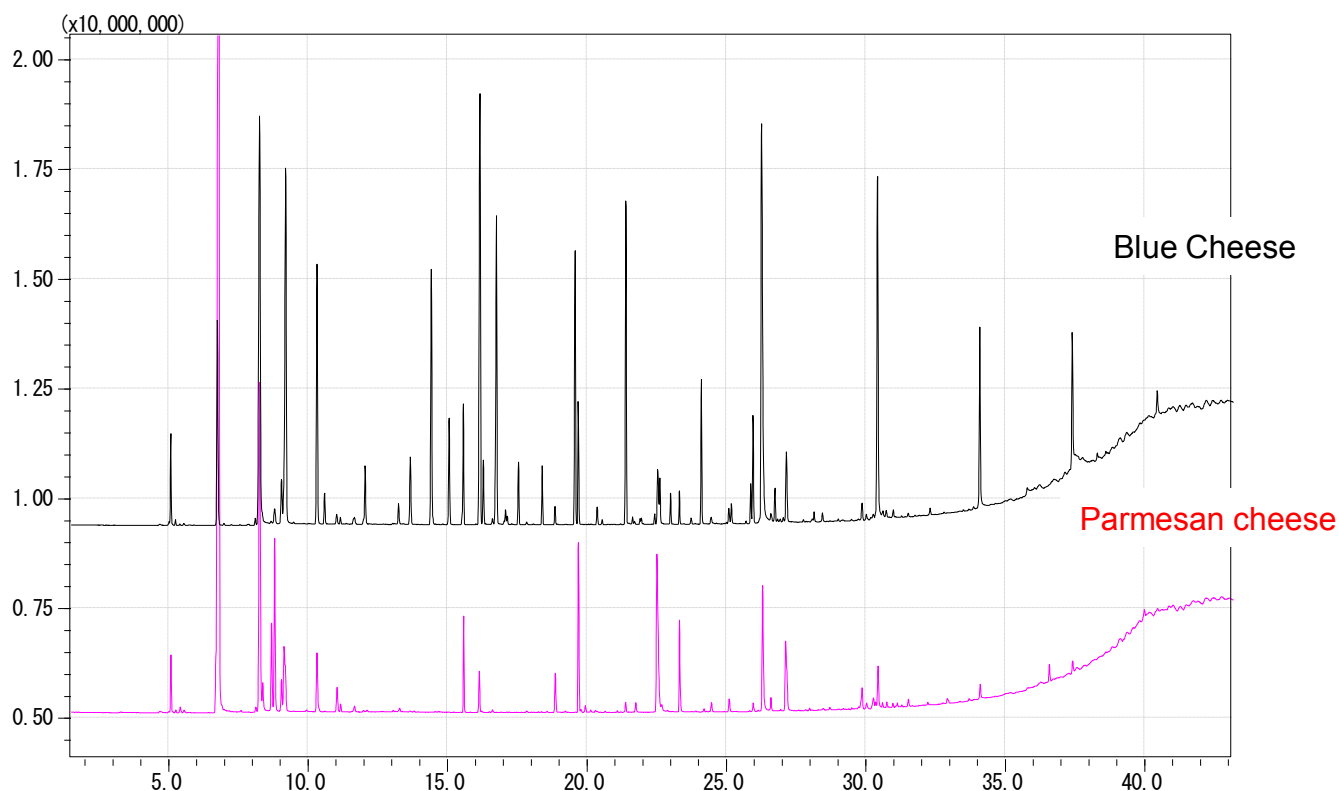


1	Methanethiol	13	D-Limonene	25	2-Furanmethanol
2	Ethyl Acetate	14	Acetoin	26	Acetamide
3	2-Butanone	15	Acetol	27	2-Tetradecanol
4	2-methylbutanal	16	Dimethylpyrazine	28	2-Tridecanone
5	3-methylbutanal	17	Dimethylpyrazine	29	Hexanoic acid
6	1-Propanol	18	Dimethylpyrazine	30	Dimethyl sulfone
7	Toluene	19	2-Nonanone	31	delta-Octalactone
8	Dimethyl disulfide	20	2,5-Dimethyl-3-ethylpyrazine	32	2-Pentadecanone
9	Hexanal	21	Benzaldehyde	33	Octanoic Acid
10	2-Pentenal	22	Isobutyric acid	34	delta-Decalactone
11	3-Penten-2-one	23	2-Undecanone	35	n-Decanoic acid
12	2-Heptanone	24	Butanoic acid		

• Compound are identified with spectral libraries.



Comparison of chromatograms



Area % of flavor components from each cheese

Components	Blue Cheese	Parmesan Cheese
Acids	17.7	3.73
Aldehyds	0.29	4.33
Pyrazineds	n.d.	0.24
S compounds	n.d.	0.24

**Thermal Desorption**

**System** :T-DEX 2

**Desorb** :Temp;200deg  
:Time;5min

**Cryo** : -150deg

**Split** : 1:0(Desorb;1, Split;0 cc/min)

**Injection** :250deg

**Column Flow**: He, 1cc/min

**GC/MS analysis:**

**System** :SHIMADZU GC-2010、GCMS-QP2010Plus

**Column** : **InertCap Pure-WAX**

0.25mmI.D. × 60m df=0.25µm

**Column Temperature** : 40°C (5min) → 6°C/min → 250°C

**Detection** : MS Scan (m/z 28.5-600)

Conditioned ready-to-use MonoTrap® for TD will be delivered to you.  
You only have to open the ampoule bottle before sampling.

Product Blank Data:

