

A Novel Approach for Aroma Components Analysis Using A Monolithic Hybrid Adsorbent As A New Generation Medium."MonoTrap"

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Introduction

A Conventional media for sample adsorption and stir bar sorptive extraction (SBSE) and solid-Phase micro extraction (SPME) are coated with an extracting polymer phase, for example, polydimethylsiloxane (PDMS). Disadvantages of conventional media are their small surface area and thin polymer phase coating resulting in low recovery and need for a long extraction time and long conditioning time. The newly introduced product, MonoTrap is a new generation media for adsorption and extraction developed by using silica monolith technology. The state-of-the-art silica monolith technology allows us to manufacture an innovative hybrid adsorbent of silica and activated carbon (or graphite carbon) having a large surface area bonded with octadecyl silane (C18, ODS). ODS bonded hybrid medium shows quite effective adsorption capability to a wide variety of compounds.

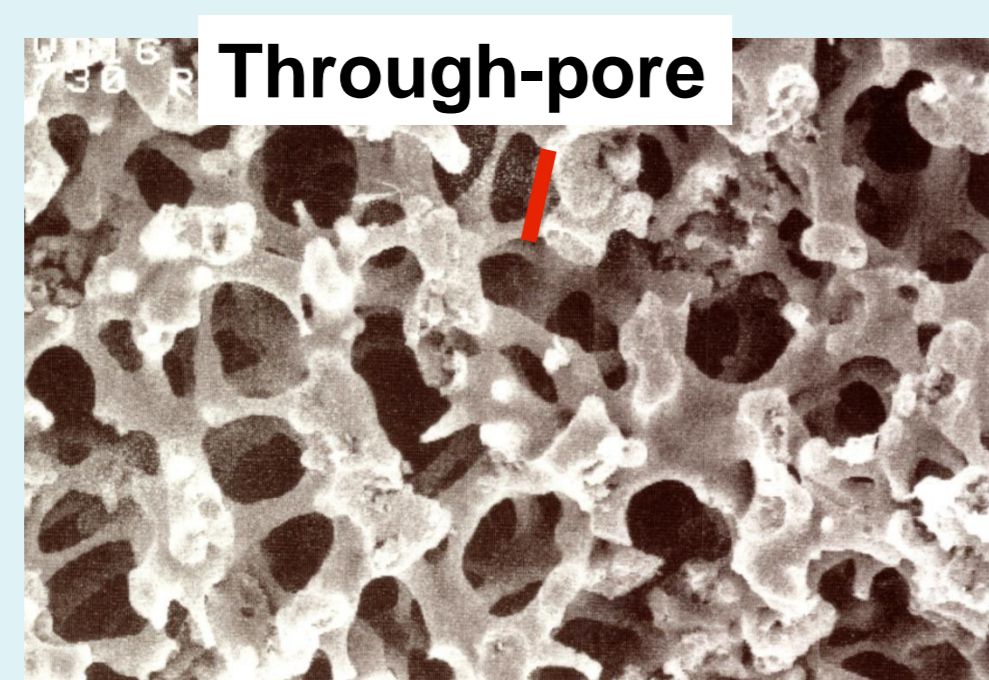
What is MonoTrap, Monolithic Material Sorptive Extraction (MMSE)

Composition of the MonoTrap is porous monolithic structure made of pure silica having a large surface area. It due to through-pores and meso-pores that compose monolithic structure. When sample passes these pores of silica monolithic structure, it is trapped by ODS groups which bonded to the surface or by activated carbon (or graphite carbon) present inside and outside the structure.

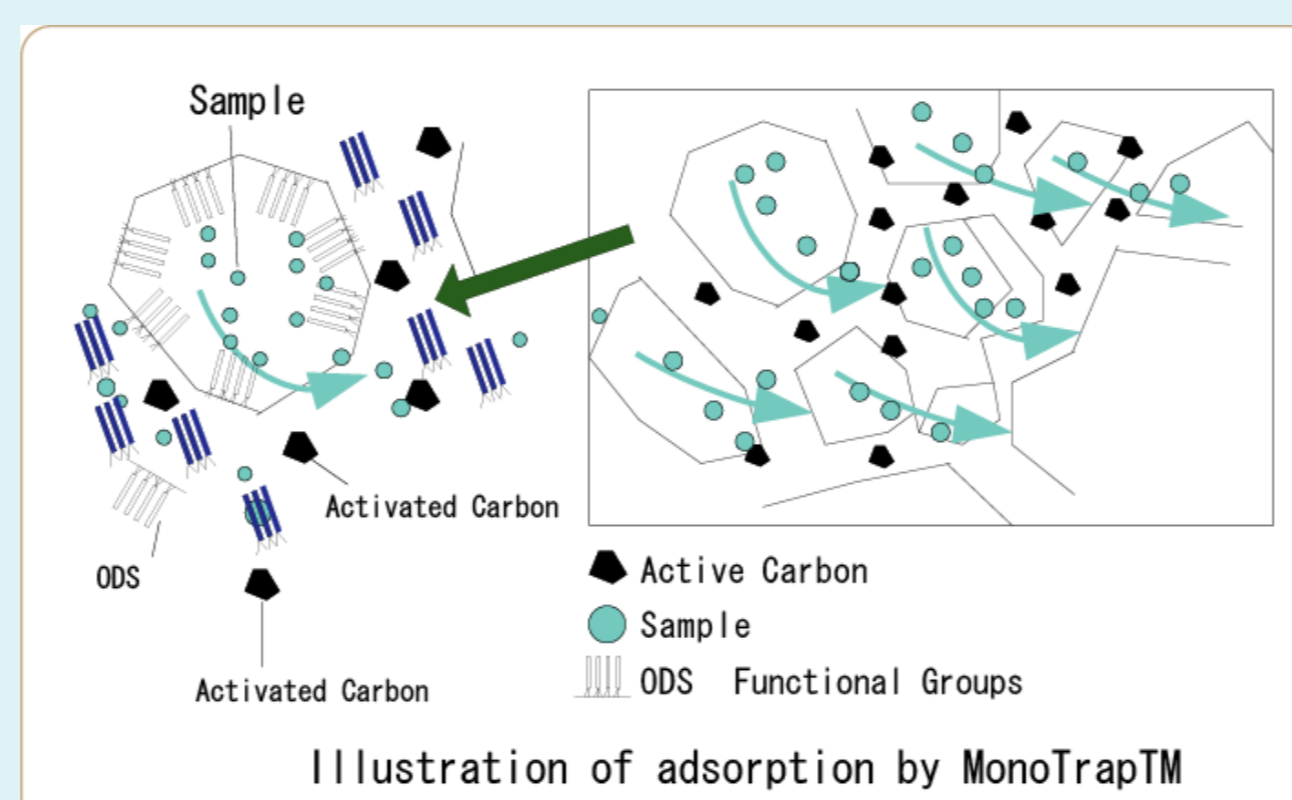
MonoTrap-TD



Through-pore



MonoTrap-TD and its monolithic structure.



Thermal Desorption (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

In this study, the aroma components of ground coffee (Tanzania Black) were analyzed by MMSE-TD (Thermal desorption) and conventional method. And difference of two kinds of coffee (Tanzania Black, Kilimanjaro) was also analyzed by MMSE-TD on the same conditions.

Instrumentation. Analyses were performed GC2010 and GCMS, QP2010 (Shimadzu) Thermal desorption unit (T-Dex) and GC Capillary Column IC-PureWAX (30mX0.25mm.i.d., df=0.25um), MonoTrap-TD (graphite carbon)

Results

1, Comparison with the conventional method.

2, Comparison of Tanzania Black and Kilimanjaro.

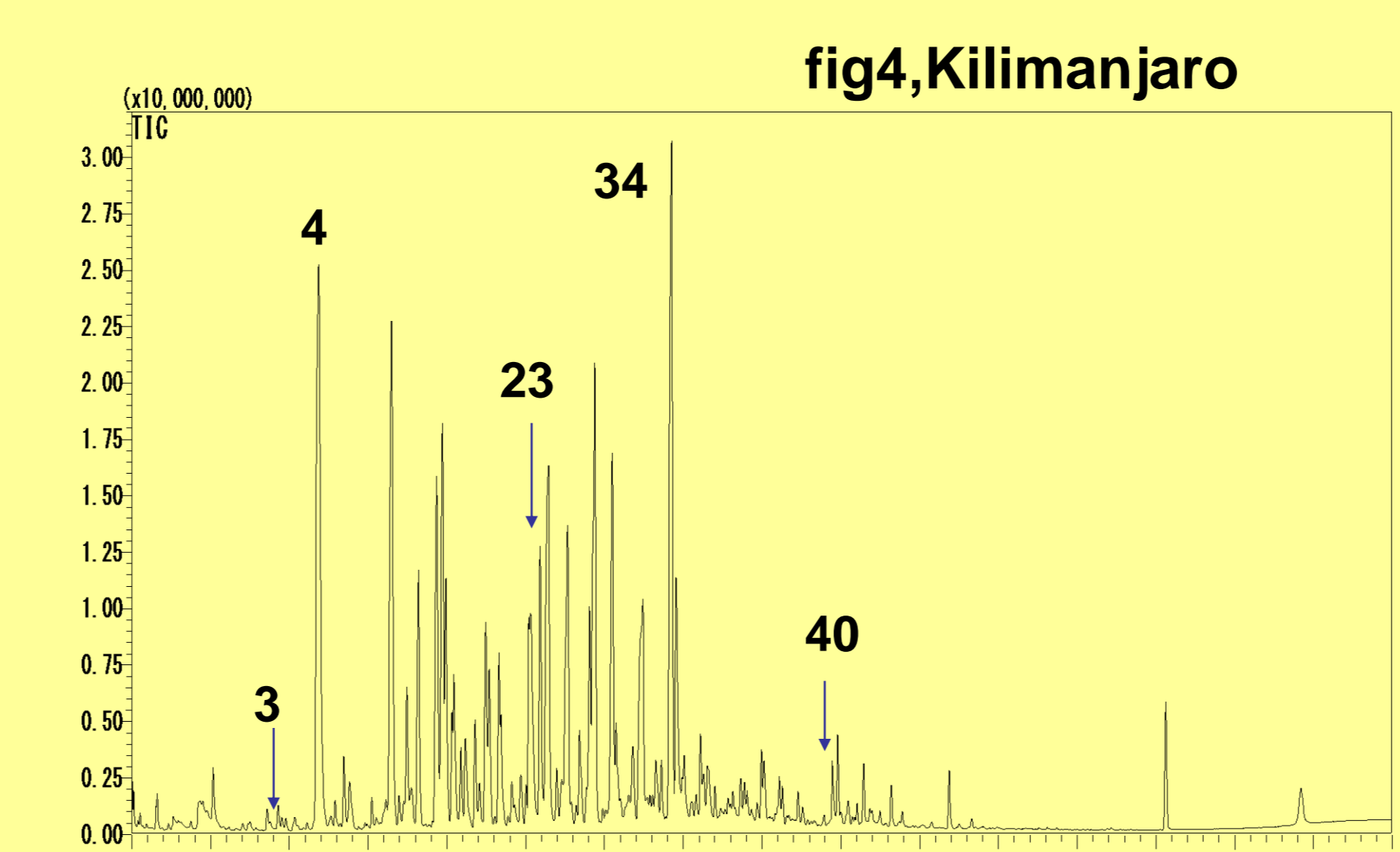
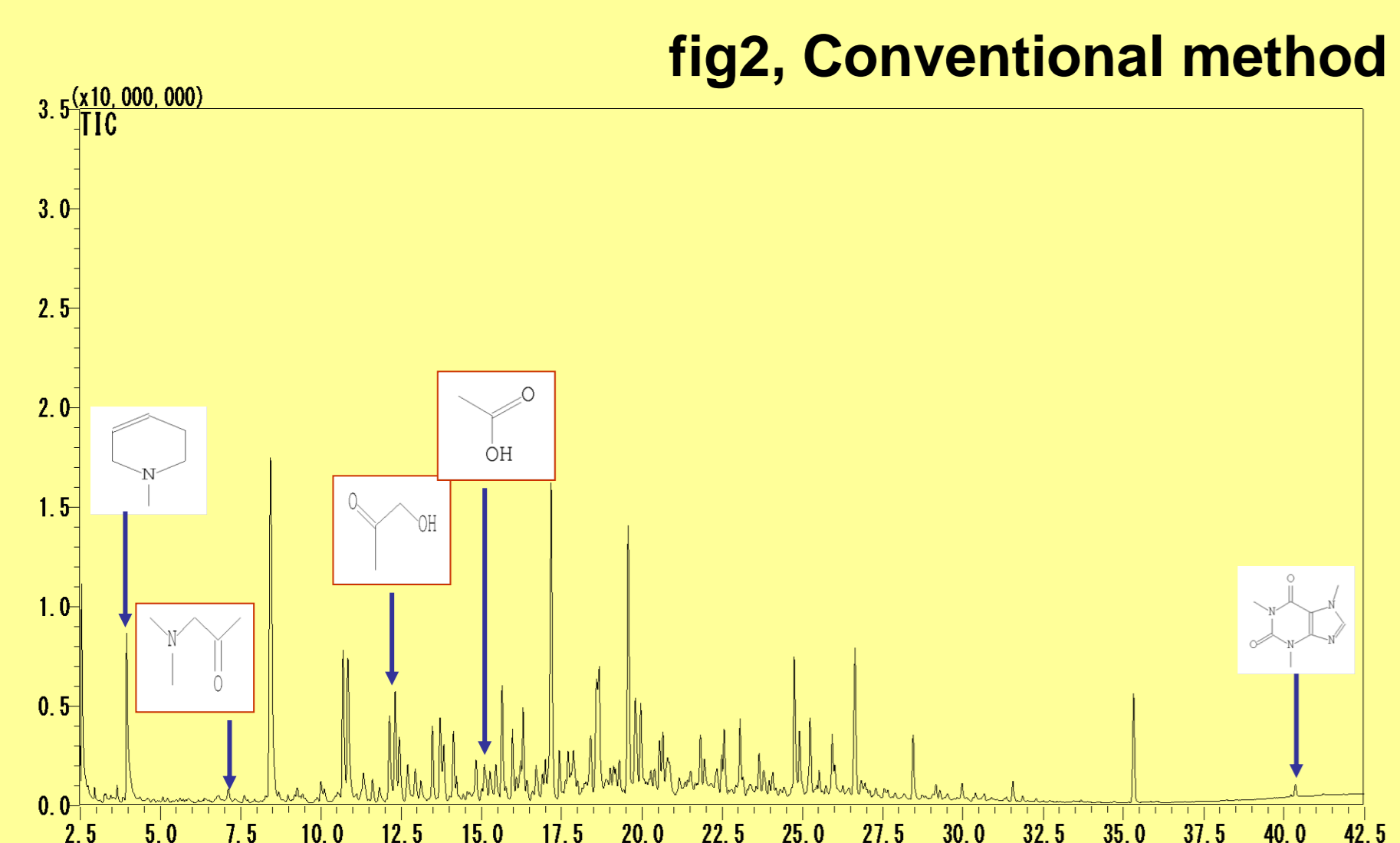
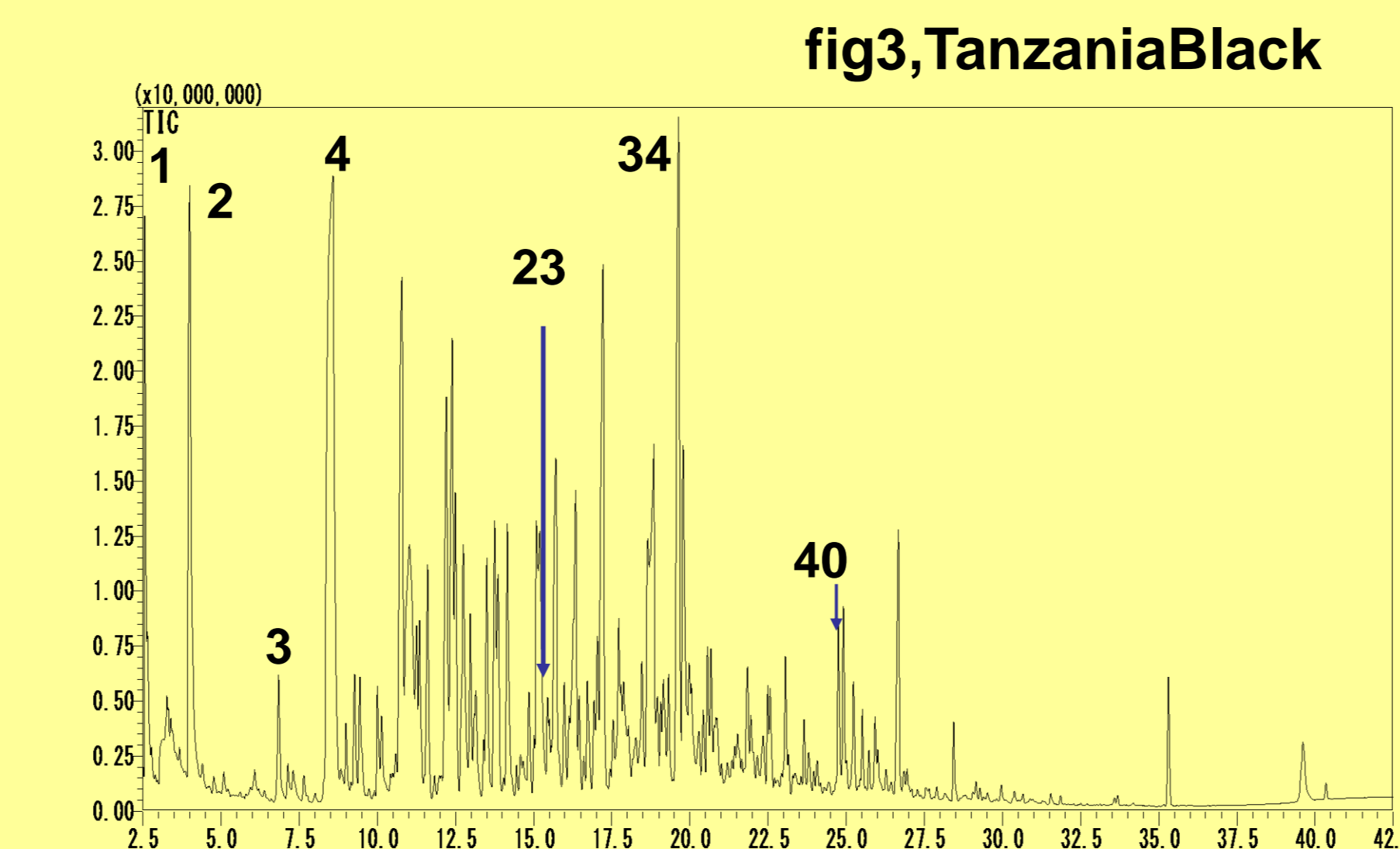
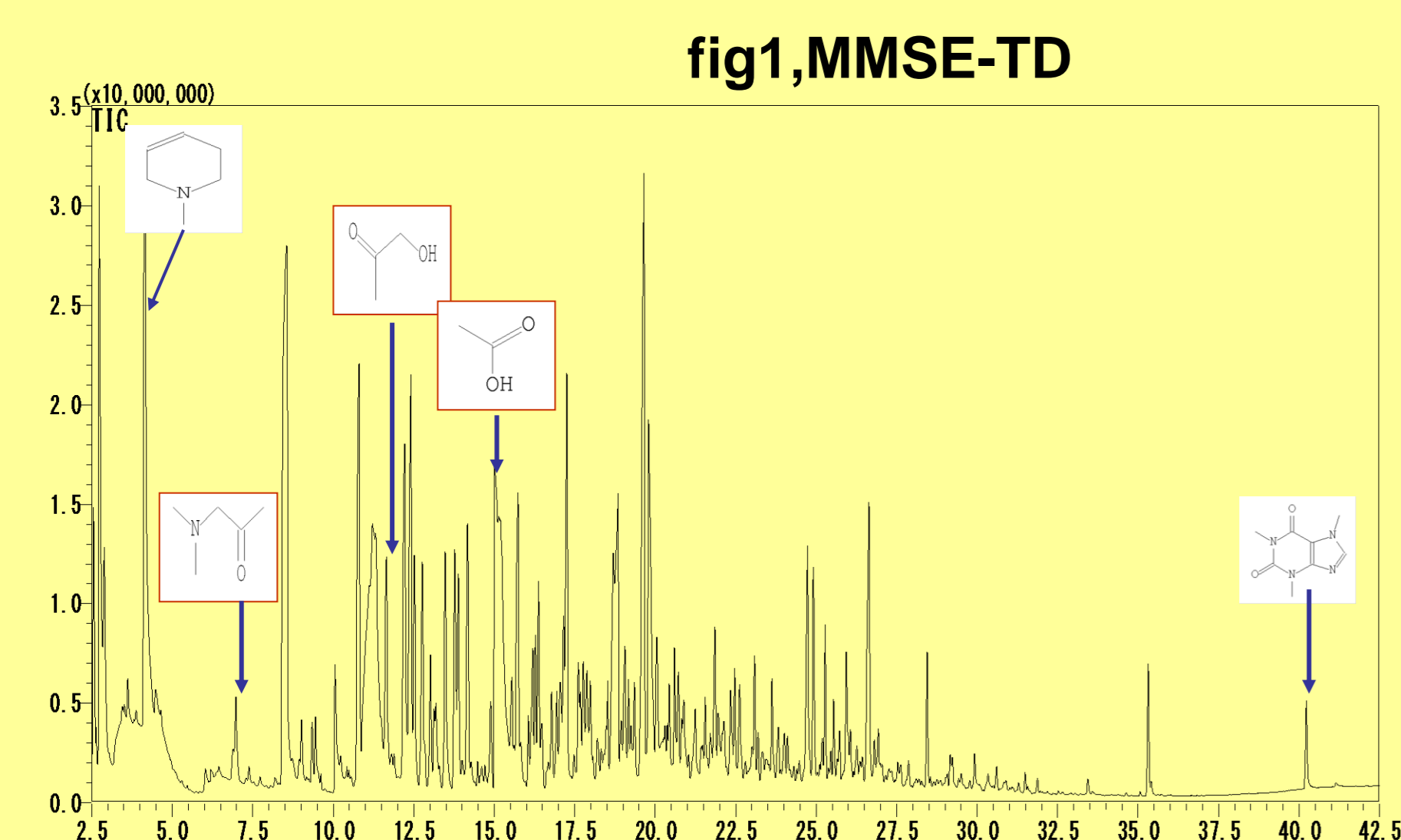


Table1, Area ratio

#	compound	Ratio
2	1-Methyl-1,2,5,6-tetrahydropyridine	4.8
3	(Dimethylamino)acetone	9.5
8	2-Propanone, 1-hydroxy-	9.6
18	Acetic acid	26.7
41	Caffein	7.2

Table2, Area / IS Area

#	name	Kilimanjaro	TanzaniaBlack
1	N-Methylpiperidine	N.D	3.09
2	N-Methyl-1,2,5,6-tetrahydropyridine	N.D	7.48
3	(Dimethylamino)acetone	0.06	1.27
4	Pyridine	9.43	18.12
23	3-Furaldehyde	2.54	0.46
34	2-Furanmethanol	7.91	8.02
40	Maltol	0.41	1.37

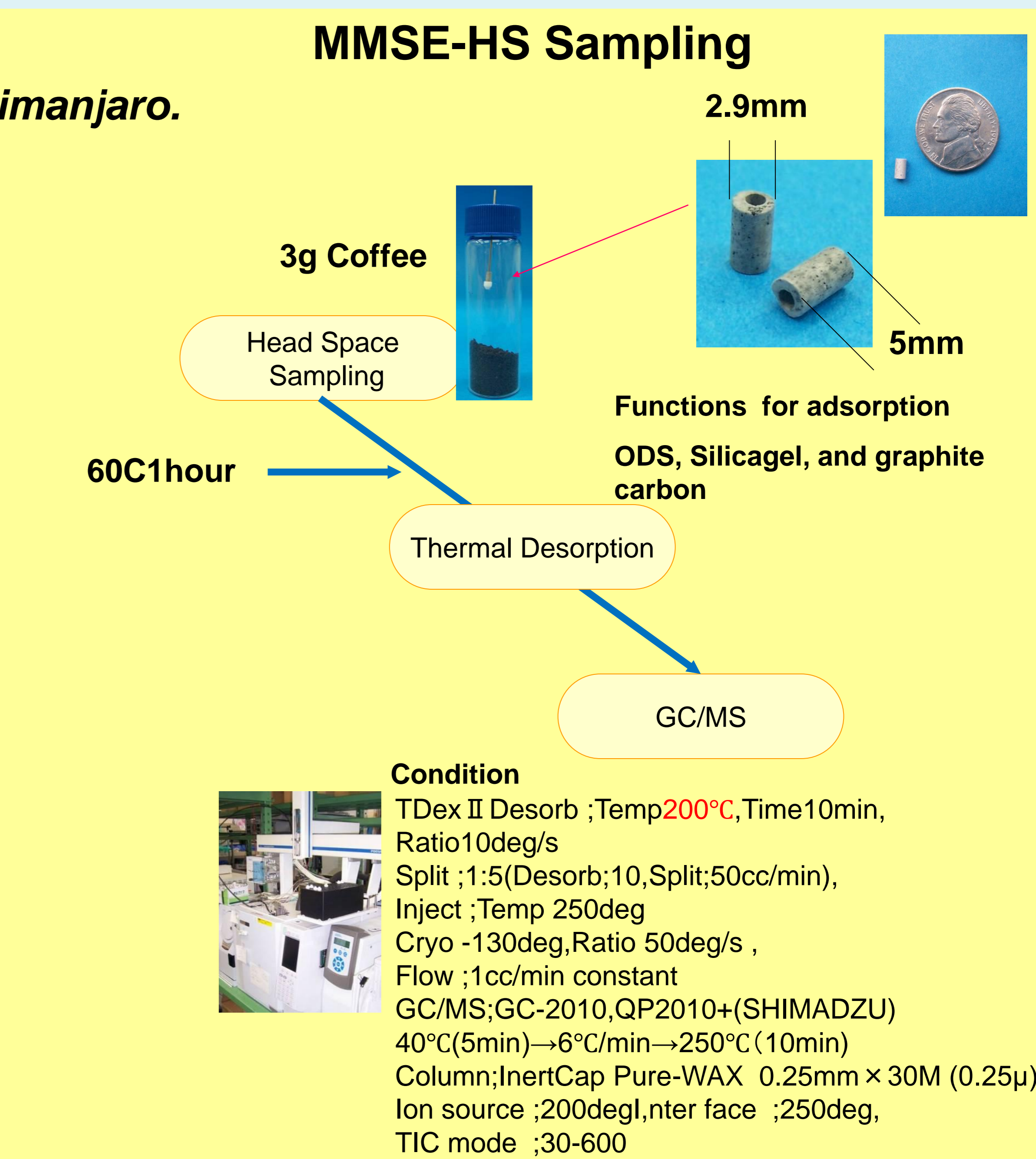


Table1:

It was confirmed that MonoTrap has the capability of the adsorption the Nitrogen compounds and Acid far better than conventional method.

Table2 :

Many Pyrazines were detected from Tanzania Black which was deep roasted. In Kilimanjaro, there was small Pyridine but many aroma aldehydes were detected.

Conclusions

Result 1. shows MMSE is advantageous to Pyrazines as compared with the conventional method. Result 2., variety of compounds that characterize each coffee were detected high sensitivity. As the reason, MonoTrap is hybrid adsorbent, and especially graphite carbon contained structure is functioning effectively. Therefore, this study shows MonoTrap-TD has quite effective adsorption ability to a wide variety of compounds.

MonoTrap can be an effective new generation tool for sorptive extraction with high sensitivity and used in the essence and perfume, food and beverage.

Reference

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"MonoTrap" is a registered trademark Based on Monolithic technologies, Merck KGaA, Da