

# APPLICATION NOTE

## HAPSITE® Smart Portable GC/MS: Detection of VOCs in a Semiconductor Fabrication Plant

### INTRODUCTION

Several of the volatile chemicals (VOCs) used in the manufacturing processes of semiconductor fabrication plants may be hazardous to the health and safety of workers. Timely monitoring for the presence and quantity of these chemicals in the plant environment provides the best protection for workers. Table 1 is a partial list of VOCs found in semiconductor fabrication plants. A method for detecting the chemicals listed in Table 1 was developed on the HAPSITE portable gas chromatograph/mass spectrometer.

### METHOD DEVELOPMENT

A default 15-minute HAPSITE air analysis method, with carbon concentrator sampling and thermal desorption, was modified to improve GC separation of analytes. Each of the 16 compound peaks in Figure 1 was sufficiently resolved for retention time and mass spectral identification. Detection limits are in the high ppt<sub>v</sub> to low ppb<sub>v</sub> range.

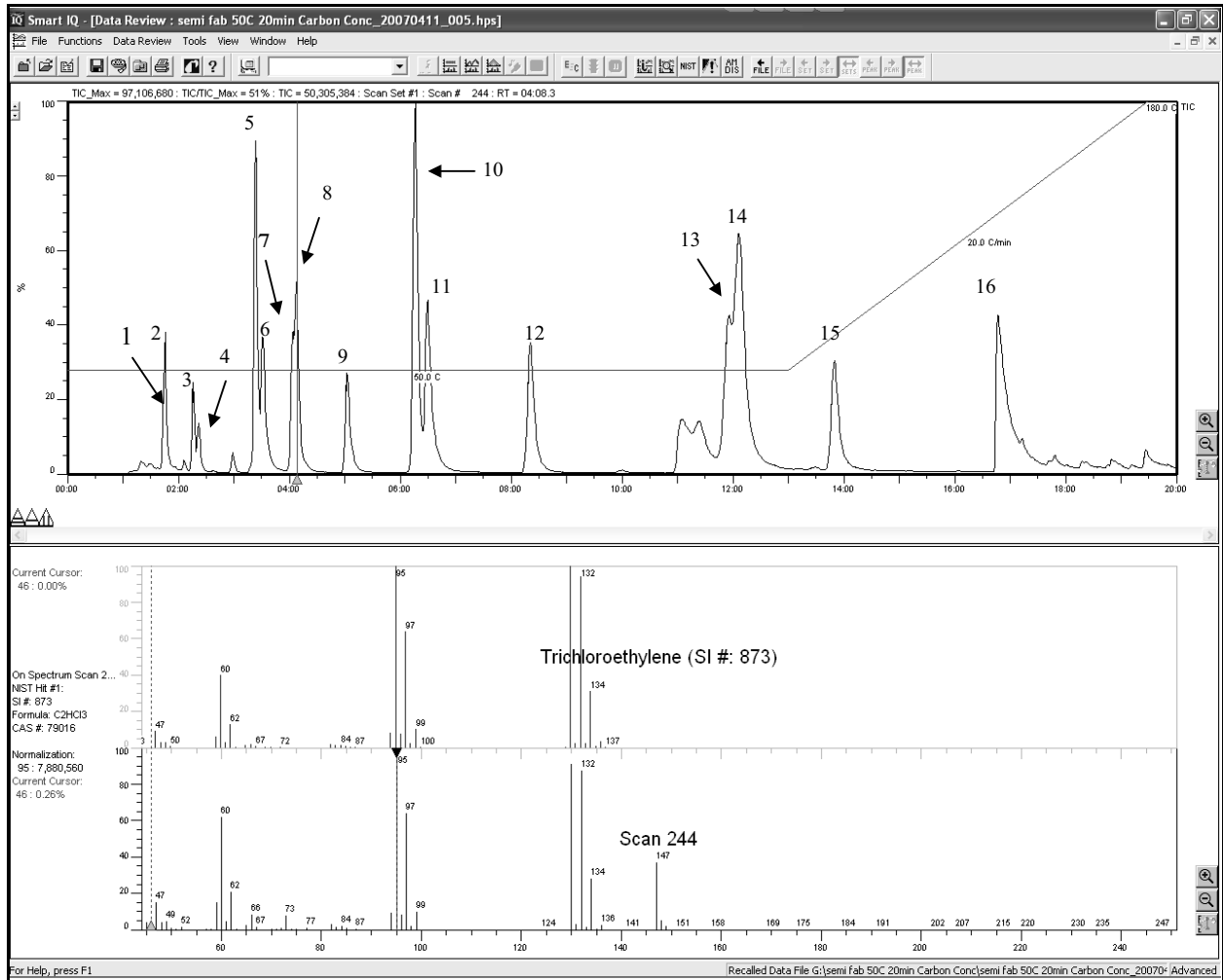
**Table 1: List of the 16 compounds of interest and their expected retention times.**

	Compound <sup>1,2</sup>	CAS #	RT
1	Acetone	67-64-1	1:44
2	Isopropanol	67-63-0	1:46
3	2-Methoxy-2methyl-propane	1634-04-4	2:16
4	2-Butanone	78-93-3	2:22
5	Benzene	71-43-2	3:23
6	1-Methoxy-2-propanol	107-98-2	3:31
7	Hexamethyldisiloxane	107-46-0	4:04
8	Trichloroethene	79-01-6	4:08
9	Methyl isobutyl ketone	108-10-1	5:02
10	Toluene	108-88-3	6:16
11	Cyclopentanone	120-92-3	6:30
12	<i>n</i> -Butyl acetate	123-86-4	8:21
13	Ethylbenzene	104-41-4	11:56
14	1-Methoxy-2-propyl acetate	108-65-6	12:07
15	2-Heptanone	110-43-0	13:50
16	1-Methyl-2-pyrrolidinone	872-50-4	16:46

1. An Rtx-1MS column (30 m, 0.32 mm I.D., 1.0 μm df) separated the analytes before MS analysis. Rtx-1MS is the standard column installed in the HAPSITE.

2. A qualitative match purity of 75% was required for positive identification of compounds.

Figure 1: A chromatogram showing 16 compounds eluting over a 20-minute period. The concentration of each compound falls in the range between 770 and 900 ppb. The red line represents the column temperature program with the initial temperature at 50 °C for 13 minutes, followed by a 20 °C/min ramp to 180 °C.



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