



**CMA Testing
and Certification
Laboratories**
廠商會檢定中心

Test Report for Environmental Monitoring

Applicant : THE CHINESE UNIVERSITY OF HONG KONG - UNIVERSITY SAFETY OFFICE
Address : (Redacted for privacy reasons.)
Application Number : LY039722(1)
Report Number : AY0069512(1)
Report Issued Date : 30 Dec 2019
Measurement Details : Air sampling and swab sampling for 2-Chlorobenzalmalonitrile (CS), Alpha-Chloroacetophenone (CN), Capsaicin & Dihydrocapsaicin (OC), Hydrogen Cyanide (HCN) and Nickel in surface dust.
Water sampling for 2-Chlorobenzalmalonitrile (CS), Alpha-Chloroacetophenone (CN), Capsaicin & Dihydrocapsaicin (OC), Cyanide and Nickel.
Address of Venue : Campus of The Chinese University of Hong Kong

For and on behalf of
CMA Industrial Development Foundation Limited

(Redacted for privacy reasons.)

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1. Introduction and Project Description

CMA Testing was appointed to conduct on-site sampling, laboratory testing, in Campus of The Chinese University of Hong Kong.

The on-site air samplings were conducted on 17 Dec 2019 to 19 Dec 2019. Nine (9) PTFE filters follow by Tenex absorption tubes for sampling of 2-Chlorobenzalmalononitrile (CS), Nine (9) Tenex absorption tubes for sampling of Alpha-Chloroacetophenone (CN), Nine (9) Glass fiber filters for sampling of Capsaicin and Dihydrocapsaicin (OC), Nine (9) soda lime absorption tubes for sampling of Hydrogen Cyanide (HCN), Nine (9) micro-cellulose membrane filters for collecting Nickel surface dust, and Nine (9) swab samples with plain sterile wooden applicator cotton tipped were collected on-site for laboratory analysis which was performed between 17 Dec 2019 and 27 Dec 2019.

The on-site water samplings were conducted on 17 Dec 2019. Six (6) batch of water samples collected with 12 x 1L in glass bottle and 6 x 1L in plastic bottle of the water sample for analysis of 2-Chlorobenzalmalononitrile (CS), Alpha-Chloroacetophenone (CN), Capsaicin and Dihydrocapsaicin (OC), Cyanide and Nickel. The samples were delivered for laboratory analysis and performed between 17 Dec 2019 and 27 Dec 2019.

2. On-site Sampling and Test Methods

On-site Air Sampling Items	Methods
2-Chlorobenzalmalononitrile (CS)	Chemical residue in air was collected using personal sampling pump connected to PTFE filter follow by Tenex absorption tube. The equipment was placed at the specified location at a height of around 1.1 metre according to the NIOSH P&CAM method 304 for 90 mins continuously.
Alpha-Chloroacetophenone (CN)	CN in air was collected using personal sampling pump connected to Tenex absorption tube. The equipment was placed at the specified location at a height of around 1.1 metre according to the NIOSH P&CAM method 291 for 60 mins continuously.
Capsaicin & Dihydrocapsaicin (OC)	OC in air was collected using personal sampling pump connected to Glass fibre filter. The equipment was placed at the specified location at a height of around 1.1 metre according to the NIOSH method 5041 for 60 mins continuously.
Hydrogen Cyanide (HCN)	HCN in air was collected using personal sampling pump connected to soda lime absorption tube. The equipment was placed at the specified location at a height of around 1.1 metre according to the NIOSH method 36010 for 240 mins continuously.
Nickel Surface Dust	Nickel dust in the specify surface was collected by wiping on a filter paper (wipe technique) or sucking into a micro-cellulose membrane filter connected to personal sampling pump (micro-vacuum technique) on a template 10 cm x 10 cm area, according to the NIOSH 7300.

On-site Swab Sampling Items	Methods
2-Chlorobenzalmalononitrile (CS), Alpha-Chloroacetophenone (CN), Capsaicin & Dihydrocapsaicin (OC), Hydrogen Cyanide (HCN) , and Nickel Surface Dust	Swab samples were collected on-site with plain sterile wooden applicator cotton tipped for laboratory analysis, according to “Evaluation Guidelines for Surface Sampling Methods” of OSHA.

On-site Water Sampling Items	Methods
2-Chlorobenzalmalononitrile (CS), Alpha-Chloroacetophenone (CN), Capsaicin & Dihydrocapsaicin (OC), Cyanide, and Nickel	Water samples were collected on-site with glass and plastic bottles. Samples were refrigerated during delivery for laboratory analysis.

Test Items of Air & Swab Samples	Methods
2-Chlorobenzalmalononitrile (CS)	The filter and absorption tubes were extracted by solvent and measured its chemical concentration using HPLC and GC/MS technique.
Alpha-Chloroacetophenone (CN)	The absorption tubes were extracted by solvent and measured its chemical concentration using GC/FID technique.
Capsaicin & Dihydrocapsaicin (OC)	The filters were extracted by solvent and measured its chemical concentration using HPLC technique.
Hydrogen Cyanide (HCN)	The absorption tubes were extracted by buffer solution and measured its chemical concentration using UV-visible spectrometer.
Nickel Surface Dust	The collected filters were digested by acid solution and measured its nickel concentration using ICP-OES.

Test Items of Water Samples	Methods
2-Chlorobenzalmalononitrile (CS)	In house method TG-ENV-WW-122
Alpha-Chloroacetophenone (CN)	In house method TG-ENV-WW-123
Capsaicin & Dihydrocapsaicin (OC)	In house method TG-ENV-WW-124
Cyanide	APHA 23ed 4500-CN E
Nickel	USEPA method 200.8

3. Environmental Monitoring Result

Air Sampling

		Date of IAQ Monitoring	2-Chlorobenzalmononitrile (CS) (mg/m ³)	Alpha-Chloroacetophenone (CN) (mg/m ³)	Capsaicin (mg/m ³)	Dihydrocapsaicin (mg/m ³)	Hydrogen Cyanide (HCN) (mg/m ³)	Nickel Surface Dust (mg/m ³)
<i>OSHA*</i>			<i>0.4</i>	<i>0.3</i>			<i>11.05</i>	<i>1</i>
Pt. 10	University Sports Centre - Yeung Ming Biu Indoor Sports Centre	17 Dec 2019	< 0.1	< 0.1	< 0.1	< 0.1	< 0.2	<0.05
Pt. 11	University Sports Centre - Reception Lobby	17 Dec 2019	< 0.1	< 0.1	< 0.1	< 0.1	< 0.2	<0.05
Pt. 12	Sir Philip Haddon - Cave Sports Field - Stadium Stand	17 Dec 2019	< 0.1	< 0.1	< 0.1	< 0.1	< 0.2	<0.05
Pt. 13	John Fulton Centre - G/F Souvenir Store	17 Dec 2019	< 0.1	< 0.1	< 0.1	< 0.1	< 0.2	<0.05
Pt. 14	Security and Transport Building - Security Office	18 Dec 2019	< 0.1	< 0.1	< 0.1	< 0.1	< 0.2	<0.05
Pt. 15	University Main Entrance - Security Check Point	18 Dec 2019	< 0.1	< 0.1	< 0.1	< 0.1	< 0.2	<0.05
Pt. 16	New Asia College - Cheng Ming Building G/F Lobby	19 Dec 2019	< 0.1	< 0.1	< 0.1	< 0.1	< 0.2	<0.05
Pt. 17	New Asia College - Staff Student Centre, Leung Hung Kee Building - G/F, Main Entrance	19 Dec 2019	< 0.1	< 0.1	< 0.1	< 0.1	< 0.2	<0.05
Pt. 18	New Asia College - Humanities Building 3/F, Lift Lobby	19 Dec 2019	< 0.1	< 0.1	< 0.1	< 0.1	< 0.2	<0.05

Note : < denotes less than;

mg/m³ denotes milligram per cubic metre;

The reporting limit of 2-Chlorobenzalmononitrile (CS) is 0.1 mg/m³;

The reporting limit of Alpha-Chloroacetophenone (CN) is 0.1 mg/m³;

The reporting limit of Capsaicin is 0.1 mg/m³;

The reporting limit of Dihydrocapsaicin is 0.1 mg/m³;

The reporting limit of Hydrogen Cyanide (HCN) is 0.2 mg/m³;

The reporting limit of Nickel Surface Dust is 0.05 mg/m³; and

All results are reported as 2-hour average.

* Occupational Safety and Health Administration of United States Department of Labor.

Swab Sampling

		Date of IAQ Monitoring	2-Chlorobenzalmononitrile (CS) ($\mu\text{g} / 100\text{cm}^2$)	Alpha-Chloroacetophenone (CN) ($\mu\text{g} / 100\text{cm}^2$)	Capsaicin ($\mu\text{g} / 100\text{cm}^2$)	Dihydrocapsaicin ($\mu\text{g} / 100\text{cm}^2$)	Hydrogen Cyanide (HCN) ($\mu\text{g} / 100\text{cm}^2$)	Nickel Surface Dust ($\mu\text{g} / 100\text{cm}^2$)
Pt. 10	University Sports Centre - Yeung Ming Biu Indoor Sports Centre	17 Dec 2019	< 0.2	< 0.2	< 0.5	< 0.5	< 0.5	< 0.5
Pt. 11	University Sports Centre - Reception Lobby	17 Dec 2019	< 0.2	< 0.2	< 0.5	< 0.5	< 0.5	< 0.5
Pt. 12	Sir Philip Haddon - Cave Sports Field - Stadium Stand	17 Dec 2019	< 0.2	< 0.2	< 0.5	< 0.5	< 0.5	< 0.5
Pt. 13	John Fulton Centre - G/F Handrails	17 Dec 2019	< 0.2	< 0.2	< 0.5	< 0.5	< 0.5	< 0.5
Pt. 14	Security and Transport Building - Security Office	18 Dec 2019	< 0.2	< 0.2	< 0.5	< 0.5	< 0.5	< 0.5
Pt. 15	University Main Entrance - Security Check Point	18 Dec 2019	< 0.2	< 0.2	< 0.5	< 0.5	< 0.5	< 0.5
Pt. 16	New Asia College - Cheng Ming Building G/F Lobby	19 Dec 2019	< 0.2	< 0.2	< 0.5	< 0.5	< 0.5	< 0.5
Pt. 17	New Asia College - Staff Student Centre, Leung Hung Kee Building - G/F, Main Entrance	19 Dec 2019	< 0.2	< 0.2	< 0.5	< 0.5	< 0.5	< 0.5
Pt. 18	New Asia College - Humanities Building 3/F, Lift Lobby	19 Dec 2019	< 0.2	< 0.2	< 0.5	< 0.5	< 0.5	< 0.5

Note : < denotes less than;

$\mu\text{g}/100\text{cm}^2$ denotes microgram per 100 square centimetres;

The reporting limit of 2-Chlorobenzalmononitrile (CS) is $0.2 \mu\text{g}/100\text{cm}^2$;

The reporting limit of Alpha-Chloroacetophenone (CN) is $0.2 \mu\text{g}/100\text{cm}^2$;

The reporting limit of Capsaicin is $0.5 \mu\text{g}/100\text{cm}^2$;

The reporting limit of Dihydrocapsaicin is $0.5 \mu\text{g}/100\text{cm}^2$;

The reporting limit of Hydrogen Cyanide (HCN) is $0.5 \mu\text{g}/100\text{cm}^2$;

The reporting limit of Nickel Surface Dust is $0.5 \mu\text{g}/100\text{cm}^2$; and

Swab samplings were conducted at locations nearby windows in the premises.

Water Sampling

		Date of Water Sampling	2-Chlorobenzalmononitrile (CS) ($\mu\text{g} / \text{L}$)	Alpha-Chloroacetophenone (CN) ($\mu\text{g} / \text{L}$)	Capsaicin and Dihydrocapsaicin (mg / L)	Cyanide (mg / L)	Nickel ($\mu\text{g} / \text{L}$)
WHO						0.07 [^]	70 [*]
Pt. 7	Sir Philip Haddon-Cave Sports Field - Drinking Water Fountain	17 Dec 2019	< 1	< 1	< 0.2	< 0.02	2.0
Pt. 8	University Sports Centre - Men Changing Room and Toilet (beside Room B04)	17 Dec 2019	< 1	< 1	< 0.2	< 0.02	1.8
Pt. 9	Security and Transport Building - Security Office, Pantry	17 Dec 2019	< 1	< 1	< 0.2	< 0.02	< 1
Pt. 10	John Fulton Centre - 1/F, Male Toilet	17 Dec 2019	< 1	< 1	< 0.2	< 0.02	< 1
Pt. 11	New Asia College - Cheng Ming Building - 1/F Pantry	17 Dec 2019	< 1	< 1	< 0.2	< 0.02	< 1
Pt. 12	New Asia College - Humanities Building - 2/F, Drinking Water Fountain	17 Dec 2019	< 1	< 1	< 0.2	< 0.02	< 1

Note : < denotes less than;

mg/L denotes milligram per litre;

$\mu\text{g} / \text{L}$ denotes microgram per litre;

The reporting limit of 2-Chlorobenzalmononitrile (CS) is 1 $\mu\text{g} / \text{L}$;

The reporting limit of Alpha-Chloroacetophenone (CN) is 1 $\mu\text{g} / \text{L}$;

The reporting limit of Capsaicin and Dihydrocapsaicin is 0.2 mg/L;

The reporting limit of Cyanide is 0.02 mg/L;

The reporting limit of Nickel is 1 $\mu\text{g} / \text{L}$; and

[^] World Health Organization – Guidelines for Drinking Water Quality, 3rd edition

^{*} World Health Organization – Guidelines for Drinking Water Quality, 4th edition

4. Conclusion

The results of on-site air sampling and swab sampling showed the concentration levels of tested pollutants (2-Chlorobenzalmalononitrile (CS), Alpha-Chloroacetophenone (CN), Capsaicin & Dihydrocapsaicin (OC), Hydrogen Cyanide (HCN), and Nickel Surface Dust) were below reporting limit and hence they were not detectable in the air and sampled surfaces.

The results of water sampling showed the concentration levels of tested pollutants (2-Chlorobenzalmalononitrile (CS), Alpha-Chloroacetophenone (CN), Capsaicin & Dihydrocapsaicin (OC) and Cyanide) were below reporting limit and hence they were not detectable in the water sources. The results of Nickel in water sampling showed the concentration levels from <1 µg/L to 2.0 µg/L. In accordance with the drinking water standards stated in World Health Organization – Guidelines for Drinking Water Quality (4th edition), the concentration of Nickel in water samples are not significant.

***** End of Report *****

Appendix I - Photo of Sampling Points



Point 10 (Air Sampling)



Point 11 (Air Sampling)



Point 12 (Air Sampling)



Point 13 (Air Sampling)



Point 14 (Air Sampling)



Point 15 (Air Sampling)



Point 16 (Air Sampling)



Point 17 (Air Sampling)



Point 18 (Air Sampling)



Point 10 (Swab Sampling)



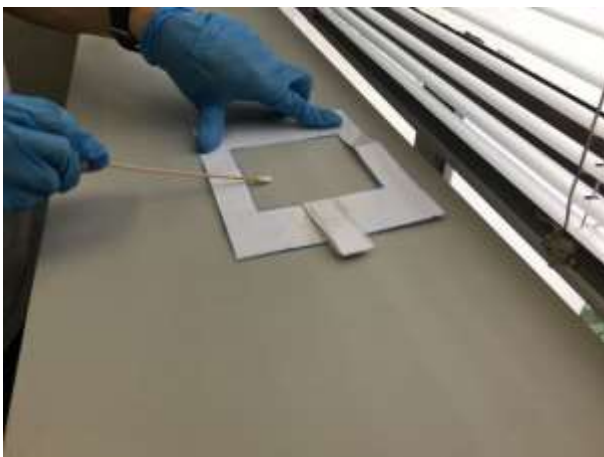
Point 11 (Swab Sampling)



Point 12 (Swab Sampling)



Point 13 (Swab Sampling)



Point 14 (Swab Sampling)



Point 15 (Swab Sampling)



Point 16 (Swab Sampling)



Point 17 (Swab Sampling)



Point 18 (Swab Sampling)



Point 7 (Water Sampling)



Point 8 (Water Sampling)



Point 9 (Water Sampling)



Point 10 (Water Sampling)



Point 11 (Water Sampling)



Point 12 (Water Sampling)