

NO: SAMM 106

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LABORATORY LOCATION:
(PERMANENT LABORATORY)
SPECTRUM LABORATORIES (JOHOR) SDN. BHD.
18A, JALAN MOLEK 2/5
TAMAN MOLEK
81100 JOHOR BAHRU
JOHOR
MALAYSIA

FIELDS OF TESTING:

CHEMICAL AND MICROBIOLOGY

This laboratory has demonstrated its technical competence to operate in accordance with MS ISO/IEC 17025:2005 (ISO/IEC 17025:2005).

This laboratory's fulfillment of the requirements of ISO/IEC 17025 means the laboratory meets both the technical competence requirements and management system requirements that are necessary for it to consistently deliver technically valid test results and calibrations. The management system requirements in ISO/IEC 17025 are written in language relevant to laboratory operations and operate generally in accordance with the principles of ISO 9001 (see Joint ISO-ILAC-IAF Communiqué dated April 2017).

SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring <ul style="list-style-type: none"> Effluent 	Alkalinity	APHA 2320 B
	Biochemical Oxygen Demand (BOD)	APHA 5210 B
	Chromium, Hexavalent	APHA 3500-Cr B
	Chromium, Trivalent	In house method no. 19 based on APHA 3500-Cr B
	Chemical Oxygen Demand (COD)	APHA 5220 B
	Chemical Oxygen Demand (COD)	APHA 5220 C
	Chemical Oxygen Demand (COD)	APHA 5220 D
	Cyanide	APHA 4500 – CN- C & F
	Cyanide	OSRMA P-456
	Colour	APHA 2120 B
Colour	APHA 2120 F	

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring		
• Effluent	Free Chlorine	APHA 4500-Cl F
	Formaldehyde	OSRMA PG-458
	Formaldehyde	APHA 6252 B
	pH	APHA 4500-H ⁺ B
	Phenol	APHA 5530 B C
	Sulphide	APHA 4500-S ²⁻ F
	Total Solids	APHA 2540 B
	Total Dissolved Solid	APHA 2540 C
	Suspended Solids	APHA 2540 D
	Fixed and volatile solids ignited at 550°C (Mixed Liquor Volatile Suspended Solids or MLVSS)	APHA 2540 E
	Mixed Liquor Suspended Solids (MLSS)	In house method No.23 based On APHA 2540 D
	Nitrite	APHA 4500-NO ₂ -B
	Nitrogen/Nitrate as N/NO ₃	AOAC 973.50
	Nitrate	APHA 4500-NO ₃ ⁻ B
	Phosphorus as P (or PO ₄)	APHA 4500-P B, C
	Chloride	APHA 4500-Cl ⁻ C
	Fluoride	APHA 4500-F ⁻ D
	Ammonia Nitrogen as N	APHA 4500-NH ₃ B, C
	Oil & Grease	APHA 5520 B
	Dissolved Oxygen	APHA 4500-O G
	Silica as SiO ₂	APHA 4500-SiO ₂ D
	Anionic Surfactant as MBAS	APHA 5540 C

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued)		
• Effluent	Hardness (EDTA)	APHA 2340 C
	Hardness (Calculation)	APHA 2340 B
	Turbidity	APHA 2130 B
	Sulphate	APHA 4500-SO ₄ ²⁻ E
	Bicarbonate Alkalinity	APHA 4500-CO ₂ D
	Carbonate Alkalinity	APHA 4500-CO ₂ D
	Free Carbon Dioxide Hydroxide Alkalinity Total Carbon Dioxide	} APHA 4500-CO ₂ D
	Preliminary Treatment of Samples:	
	Digestion for metals	APHA 3030 D
	Nitric Acid Digestion	APHA 3030 E
	Nitric Acid-Hydrochloric Acid Digestion	APHA 3030 F
	Aluminium	APHA 3500-AI B
	Antimony	In house method no. 20 based on APHA 3114 C
	Arsenic	APHA 3114 C
	Boron	APHA 4500-B C
	Mercury	APHA 3112 B
	Selenium	APHA 3114 C
	Tin	In house method No.1 based on APHA 3114 C

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Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
<p>Environmental Monitoring (continued)</p> <ul style="list-style-type: none"> Effluent 	<p>Cadmium Calcium as Ca Chromium, Total Cobalt Copper Gold Iron Lead Magnesium Manganese Nickel Potassium Silver Sodium Zinc</p> <p>Volatile Organic Compounds (VOC) Benzene Toluene Ethylbenzene o-Xylene m,p-Xylene Total Xylene</p> <p>Trihalomethanes (THM) Chloroform Dichlorobromomethanes Dibromochloromethanes Bromoform</p> <p>Chlorinated Phenoxy Acid Herbicides: 2,4-D</p>	<p>APHA 3111 B</p> <p>APHA 6200 B</p> <p>APHA 6232 C</p> <p>APHA 6640 B (18th Edition)</p>

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Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
<p>Environmental Monitoring (continued)</p> <ul style="list-style-type: none"> Effluent 	<p>Organochlorine Pesticides Aldrin α-BHC β-BHC δ-BHC γ-BHC (Lindane) 4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin Endosulfan I Endosulfan II Endosulfan sulfate Endrin Endrin aldehyde Endrin Ketone Heptachlor Heptachlor epoxide (isomer B) 4,4'-Methoxychlor Chlordane Hexachlorobenzene</p> <p>Ammoniacal Nitrogen Beryllium Molybdenum Vanadium Palladium</p>	<p>APHA 6630 B</p> <p>APHA 4500-NH₃ F APHA 3120 B APHA 3120 B APHA 3120 B In house method No. 31 based on APHA 3120 B</p>

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring		
• Water	Alkalinity	APHA 2320 B
	Biochemical Oxygen Demand (BOD)	APHA 5210 B
	Chromium, Hexavalent	APHA 3500-Cr B
	Chromium, Trivalent	In house method no. 19 based on APHA 3500-Cr B
	Chemical Oxygen Demand (COD)	APHA 5220 B APHA 5220 C APHA 5220 D
	Cyanide	APHA 4500 – CN ⁻ C & F
	Cyanide	OSRMA P-456
	Colour	APHA 2120 B
	Colour	APHA 2120 F
	Free Chlorine	APHA 4500-Cl F
	Formaldehyde	OSRMA PG-458
	Formaldehyde	APHA 6252 B
	pH	APHA 4500-H ⁺ B
	Phenol	APHA 5530 B C
	Sulphide	APHA 4500-S ²⁻ F
	Total Solids	APHA 2540 B
	Total Dissolved Solid	APHA 2540 C
	Suspended Solids	APHA 2540 D

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Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued)		
<ul style="list-style-type: none"> Water 	Fixed and volatile solids ignited at 550°C (Mixed Liquor Volatile Suspended Solids or MLVSS)	APHA 2540 E
	Mixed Liquor Suspended Solids (MLSS)	In house method No.23 based On APHA 2540 D
	Nitrite	APHA 4500-NO ₂ -B
	Nitrogen/Nitrate as N/NO ₃	AOAC 973.50
	Nitrate	APHA 4500-NO ₃ ⁻ B
	Phosphorus as P (or PO ₄)	APHA 4500-P B, C
	Chloride	APHA 4500-Cl ⁻ C
	Fluoride	APHA 4500-F ⁻ D
	Ammonia Nitrogen as N	APHA 4500-NH ₃ B, C
	Oil & Grease	APHA 5520 B
	Dissolved Oxygen	APHA 4500-O G
	Silica as SiO ₂	APHA 4500-SiO ₂ D
	Anionic Surfactant as MBAS	APHA 5540 C
	Hardness (EDTA)	APHA 2340 C
	Hardness (Calculation)	APHA 2340 B
	Turbidity	APHA 2130 B
	Sulphate	APHA 4500-SO ₄ ²⁻ E
	Bicarbonate Alkalinity	APHA 4500-CO ₂ D
	Carbonate Alkalinity	APHA 4500-CO ₂ D

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Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued) <ul style="list-style-type: none"> Water 	Free Carbon Dioxide Hydroxide Alkalinity Total Carbon Dioxide	} APHA 4500-CO ₂ D
	Preliminary Treatment of Samples:	
	Digestion for metals	APHA 3030 D
	Nitric Acid Digestion	APHA 3030 E
	Nitric Acid-Hydrochloric Acid Digestion	APHA 3030 F
	Aluminium	APHA 3500-AI B
	Antimony	In house method no. 20 based on APHA 3114 C
	Arsenic	APHA 3114 C
	Boron	APHA 4500-B C
	Cadmium	} APHA 3111 B
	Calcium	
	Chromium, Total	
	Cobalt	
	Copper	
	Gold	
	Iron	
	Lead	
	Magnesium	
	Manganese	
	Nickel	
Potassium		
Silver		
Sodium		
Zinc		
Mercury	APHA 3112 B	
Selenium	APHA 3114 C	
Tin	In house method No.1 based on APHA 3114 C	

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Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued) <ul style="list-style-type: none"> Water 	Volatile Organic Compounds (VOC) Benzene Toluene Ethylbenzene o-Xylene m,p-Xylene Total Xylene Trihalomethanes (THM) Chloroform Dichlorobromomethanes Dibromochloromethanes Bromoform Organochlorine Pesticides Aldrin α-BHC β-BHC δ-BHC γ-BHC (Lindane) 4,4'-DDD 4,4'-DDE 4,4'-DDT Dieldrin Endosulfan I Endosulfan II Endosulfan sulfate Endrin Endrin aldehyde Endrin Ketone Heptachlor Heptachlor epoxide (isomer B) 4,4'-Methoxychlor Chlordane Hexachlorobenzene Chlorinated Phenoxy Acid Herbicides: 2,4-D	} APHA 6200 B } APHA 6232 C } APHA 6630 B } APHA 6640 B (18th Edition)

SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
<p>Environmental Monitoring</p> <ul style="list-style-type: none"> Rubber/ Palm Oil Mill Effluent 	<p>pH</p> <p>Chemical Oxygen Demand (COD) Ammoniacal Nitrogen as NH₄-N</p> <p>Suspended Solids Oil & Grease Biochemical Oxygen Demand (BOD₃) 3 days at 30°C</p>	<p>APHA 4500-H+B</p> <p>} DOE (M) 1985 (Reference Method)</p> <p>} DOE (M) 1985 (Alternative Method)</p>
<ul style="list-style-type: none"> Sewage Effluent 	<p>Antimony Aluminium Arsenic Boron Barium Bismuth Calcium Cadmium Cobalt Chromium Copper Iron Gallium Indium Potassium Lithium Magnesium Manganese Sodium Nickel Lead Silicon Silver Selenium Strontium Thallium Zinc</p> <p>Mercury</p> <p>Tin</p>	<p>} APHA 3120 B</p> <p>In-house method No. 24 based on APHA 3120 B</p> <p>In-house method No. 25 based on APHA 3120 B</p>

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Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
<p>Environmental Monitoring</p> <ul style="list-style-type: none"> Sewage 	<p>Chemical Oxygen Demand (COD)</p> <p>Biochemical Oxygen Demand (BOD)</p> <p>Suspended Solid</p> <p>Ammonia Nitrogen As N</p> <p>Nitrate as N</p> <p>Phosphorus as P (or PO₄)</p> <p>Oil & Grease</p>	<p>APHA 5220 C</p> <p>APHA 5210 B, APHA 4500-O G</p> <p>APHA 2540 D</p> <p>APHA 4500-NH₃ B, C</p> <p>APHA 4500-NO₃⁻ B</p> <p>APHA 4500-P, B, C</p> <p>APHA 5520 B</p>
<p>Water</p> <ul style="list-style-type: none"> Marine Water 	<p>Antimony</p> <p>Aluminium</p> <p>Arsenic</p> <p>Boron</p> <p>Barium</p> <p>Cadmium</p> <p>Chromium</p> <p>Copper</p> <p>Iron</p> <p>Manganese</p> <p>Nickel</p> <p>Lead</p> <p>Silver</p> <p>Selenium</p> <p>Zinc</p> <p>Mercury</p> <p>Tin</p> <p>Ammoniacal Nitrogen</p>	<p>APHA 3120 B</p> <p>In-house method No. 24 based on APHA 3120 B</p> <p>In-house method No. 25 based on APHA 3120 B</p> <p>APHA 4500-NH₃ F</p>

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
<p>Water</p> <ul style="list-style-type: none"> • Drinking Water • Potable Water • Processed Water • Surface Water • Ground Water • Mineral Water 	<p>Antimony Aluminium Arsenic Boron Barium Bismuth Calcium Cadmium Cobalt Chromium Copper Iron Gallium Indium Potassium Lithium Magnesium Manganese Sodium Nickel Lead Silicon Silver Selenium Strontium Thallium Zinc</p> <p>Mercury</p> <p>Tin</p>	<p>APHA 3120 B</p> <p>In-house method No. 24 based on APHA 3120 B</p> <p>In-house method No. 25 based on APHA 3120 B</p>
<ul style="list-style-type: none"> • Drinking Water 	<p>Beryllium Molybdenum Vanadium Palladium</p>	<p>APHA 3120 B APHA 3120 B APHA 3120 B In house method No. 31 based on APHA 3120 B</p>

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Foods		
• Seafood	Salt (Chlorine as Sodium Chloride)	AOAC 937.09
• Meats	Sulfurous acid (Free)	AOAC 892.02
• Non-solid Food and Beverages	Benzoic acid	AOAC 960.38
• Vitamin Preparations and Juices	Ascorbic acid	AOAC 967.21
• Molasses	Total Sugar expressed as Invert Sugar	AOAC 968.28
• Baking Powders	Starch	AOAC 920.44
• Cured Meat	Nitrites	AOAC 973.31
• Cocoa Products	Fat Moisture	AOAC 963.15 AOAC 931.04
• Fruits and Fruits Products	Phosphorus	AOAC 970.39
• Vinegar	Total acids	AOAC 930.35 (J) (1995)
• Milk	Nitrogen (Total)	AOAC 991.20 (1995)
• Food	Zinc	AOAC 969.32 and
	Na, Pb, Ca, Cu, K, Mn, Mg, Zn, Cd, Ag, Ni, Cr and Fe	In-house method no. 18 based on AAS Instrument Manual
	Ash	AOAC 31.012 (method 1)

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SCOPE OF TESTING: CHEMICAL**SITE: CATEGORY I**

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring <ul style="list-style-type: none"> • Flue Gas 	Determination of particulate emissions from stationary sources Determination of sulfur dioxide emissions from stationary sources Determination of nitrogen oxide emissions from stationary sources Determination of sulfuric acid mist and sulfur dioxide emissions from stationary sources Determination of metals emissions from stationary sources Determination of concentration & mass flow of particulate matter in flue gas for stationary source emissions Determination of dark smoke emissions from chimney using Ringelmann Smoke Chart Determination of dark smoke emissions from chimney using Ringelmann Smoke Chart Sampling of hydrogen halide and halogen emissions from stationary sources – isokinetic method Determination of NO & NO ₂ Determination of CO & O ₂	EPA 40 CFR 60, App.A, Method - 5 EPA 40 CFR 60, App.A, Method - 6 EPA 40 CFR 60, App.A, Method - 7 EPA 40 CFR 60, App.A, Method - 8 EPA 40 CFR 60, App.A, Method -29 MS 1596 : 2003 United States Department of the Interior Bureau of Mines IC 8333, 1967 BS 2742:1969 US EPA Method 26A, 1998 (sampling) In house method No. 28 based on Manufacturer Method In house method No. 29 based on Manufacturer Method

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SCOPE OF TESTING: CHEMICAL**SITE: CATEGORY I**

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring		
<ul style="list-style-type: none"> Air 	Ambient Air-Determination of Total Suspended Particulates (TSP)	AS 2724.3
	Ambient Air-Determination of Lead (Pb)	AS 2800
	Nitrogen Dioxide (NO ₂) in the atmosphere (24 hrs Average)	ISC Method 408
	Sulphur Dioxide (SO ₂) in the atmosphere	ISC Method 704A
	Suspended Particulate Matter – PM ₁₀	AS 3580.9.6 - 1990
	Determination of lead from workplace	NIOSH 7082
	Volatile Organic Compounds (screening) at workplace (Refer to Appendix I)	NIOSH 2549
	Ambient Air- Determination of PM 2.5	In house method no. 27 based on Manufacturer Method
	Ambient Air- Determination of PM 10	In house method no. 27A based on Manufacturer Method
<ul style="list-style-type: none"> Environment 	Measurement of noise	ISO 1996/1
<ul style="list-style-type: none"> Effluent 	pH Temperature Dissolved oxygen	APHA 4500 H+B APHA 2550 B APHA 4500-O G
<ul style="list-style-type: none"> Water 	pH Temperature Dissolved oxygen	APHA 4500 H+B APHA 2550 B APHA 4500-O G
<ul style="list-style-type: none"> Sewage 	Temperature pH	APHA 2550 B APHA 4500-H+ B

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SCOPE OF TESTING: CHEMICALNote:

- APHA Methods : Standard Methods for the Examination of Water and Wastewater, American Public Health Association, American Water Works Association and Water Environment Federation, 21st Edition, 2005
 OSRMA Methods : Official Standardised and Recommended methods of Analysis, 2nd Edition, 1973
 DOE Methods : Revised Standard Methods for Analysis of Rubber and Palm Oil Mill Effluent , 2nd Edition, 1995
 AS : Australia Standard
 ISC Methods : Methods of Air Sampling and Analysis, 3rd Edition, 1990. APHA Intersociety Committee.
 AOAC Methods : Association of Official Analytical Chemists, 13th Edition, 1995
 NIOSH : National Institute of Occupational Safety and Health, 4th Edition 1984.
 ISO Method : International Organization for Standardization, First Edition 1982.
 BS : British Standard, First Revision 1969.
 MS : Malaysian Standard , ICS 13.040.40, 2003
 EPA : Environmental Protection Agency, Part 60 Revised as of July 1,1998

Signatories:

- | | | | |
|----|----------------------|--------------------------------|-----------------------|
| 1. | Siew Yoke Lan | IKM No.: L/0747/1771/86 | |
| 2. | Kan King Choy | IKM No.: L/0797/1886/88 | (Non-resident) |
| 3. | Low Poh Ling | IKM No.: L/1237/4016/99 | |

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SCOPE OF TESTING: MICROBIOLOGY

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Food	Aerobic Plate Count/Total Plate Count	FDA – BAM Chapter 3
	Yeast and Mold	FDA – BAM Chapter 18
	Coliform, Fecal Coliform and E. coli	FDA – BAM Chapter 4
	Staphylococcus aureus	FDA – BAM Chapter 12
Water	Heterotrophic Plate Count/Total Plate Count	APHA 9215 B
	Heterotrophic Plate Count/Total Plate Count	APHA 9215 C
	Coliform	APHA 9221 B
	Fecal Coliform and Escherichia coli	APHA 9221 E
	Coliform (Membrane Filtration method)	In house method No. 12 based on APHA 9222 B
	Escherichia coli (Membrane Filtration method)	In house method No. 13 based on APHA 9222 G

Note:

- APHA Methods : Standard Methods for the Examination of Water and Wastewater, American Public Health Association, American Water Works Association and Water Environment Federation, 21st Edition, 2005
- FDA Methods : Bacteriological Analytical Manual, Food & Drug Administration, Edition 8 Revision A, 1998

Signatories:

1. Prof. Dr. Thong Kwai Lin (Non-resident)
2. Siew Yoke Lan IKM No.: L/0747/1771/86