Last Edited: ver. June 13, 2021

Company Overview

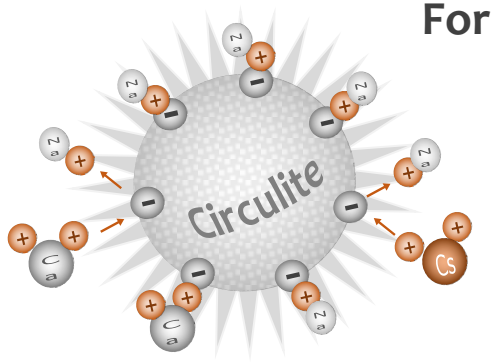
Developed as Porous and Electric Charged Material for next generation

Multi-Functional Material Recycled from Waste Materials

CircuLite: Chemical Compound of Crystalline Aluminosilicate

Environmental Solution Technology

For future generations



Presenter: Sean Shunsuke Kumagai
Environmental Counselor: Ministry of Environmental of Japan

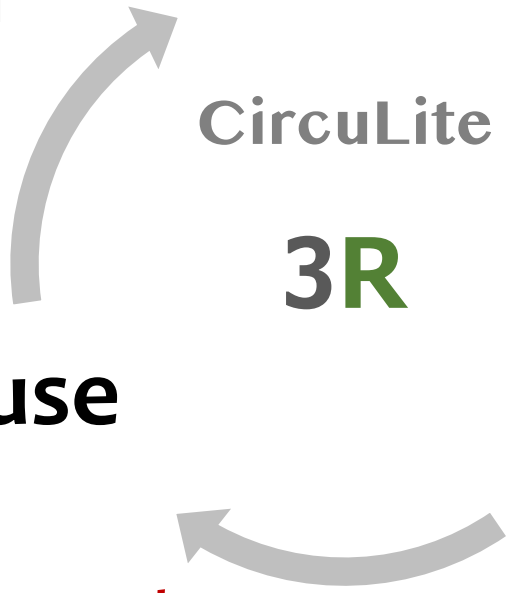
Sion Corporation

UNIDO ITPO Tokyo's STePP Sustainable Technology Promotion Platform

SUSTAINABLE DEVELOPMENT GOALS

Our Basic Concept: 3R as Venous Industrial for next generation

We move to tap transformative power of science, technology and innovation to achieve Sustainable Development Goals.



Reduce

Reduce **Waste Ashes**

Recycled as Raw Material

There is no method to landfill the Waste Ashes Safety

Recycle: Technology

Recycled Waste Ashes to **Multi-Functional Material**

Reuse

Recycled Material

Contribute to **Environment**

Solutions Business all over the world

SUSTAINABLE DEVELOPMENT GOALS

Sion Corporation

Section-01

Introduce outline of our Skill and Products

1-1. Technical Outline : Residues Recycling Technology to Multi-Functional Material: CircuLite

Carbide, Ash, Residues → CircuLite: $CaO \cdot SiO_2 \cdot Al_2O_3 \cdot nH_2O + \alpha$

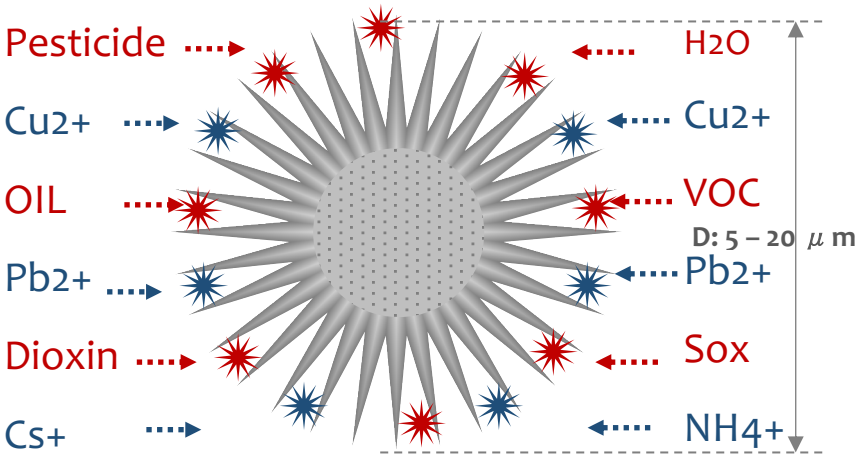
■: Included SiO_2 + Al_2O_3 + Harmful Materials

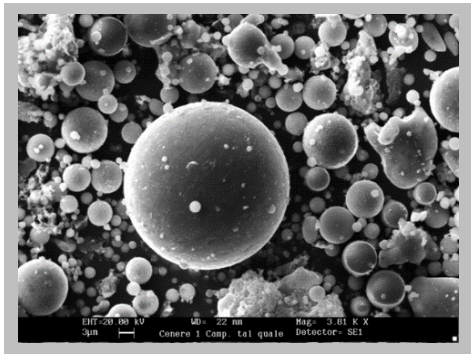
Spherical object
No Function
Case: By-Product

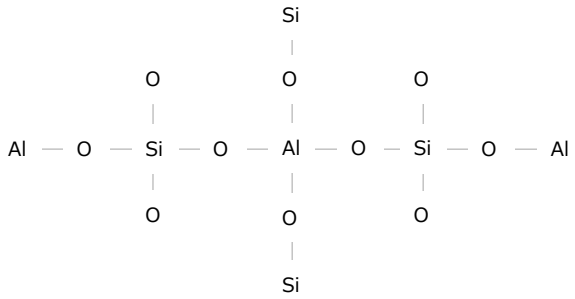
Core Technology

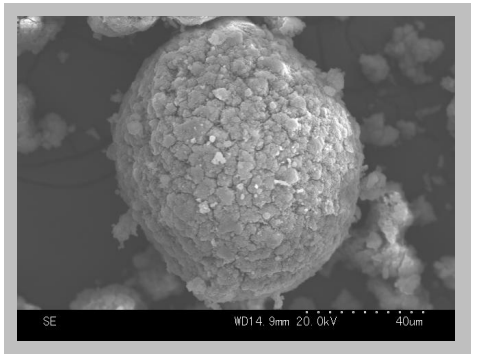
Crystallized Surface of Ash
By our Original Technology
as Venous Industrial System

■: Physical Adsorption ■: Chemical Adsorption









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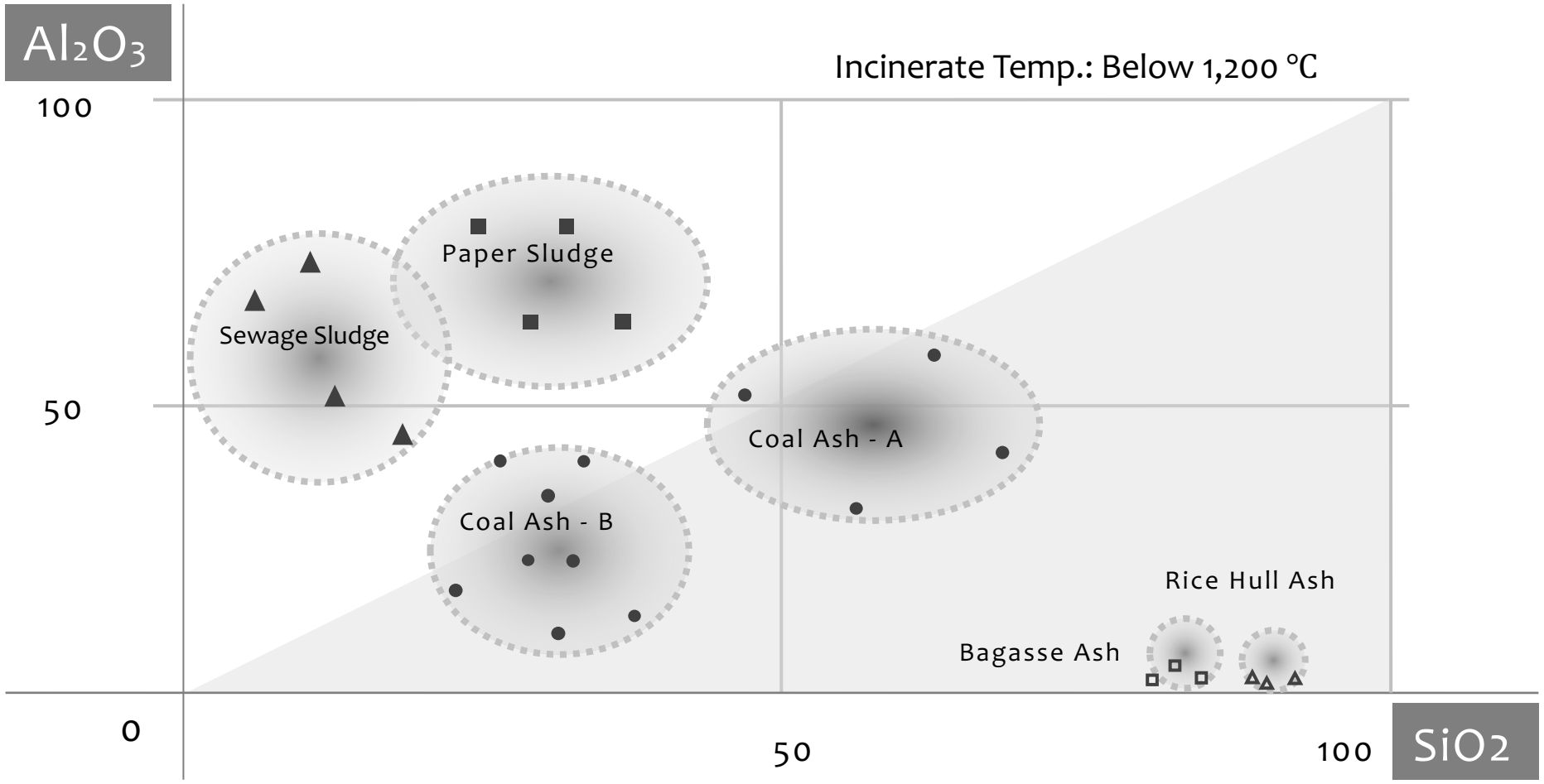
1-2. Technical Outline: Main Components of various Carbide, Ash as raw material of CircuLite



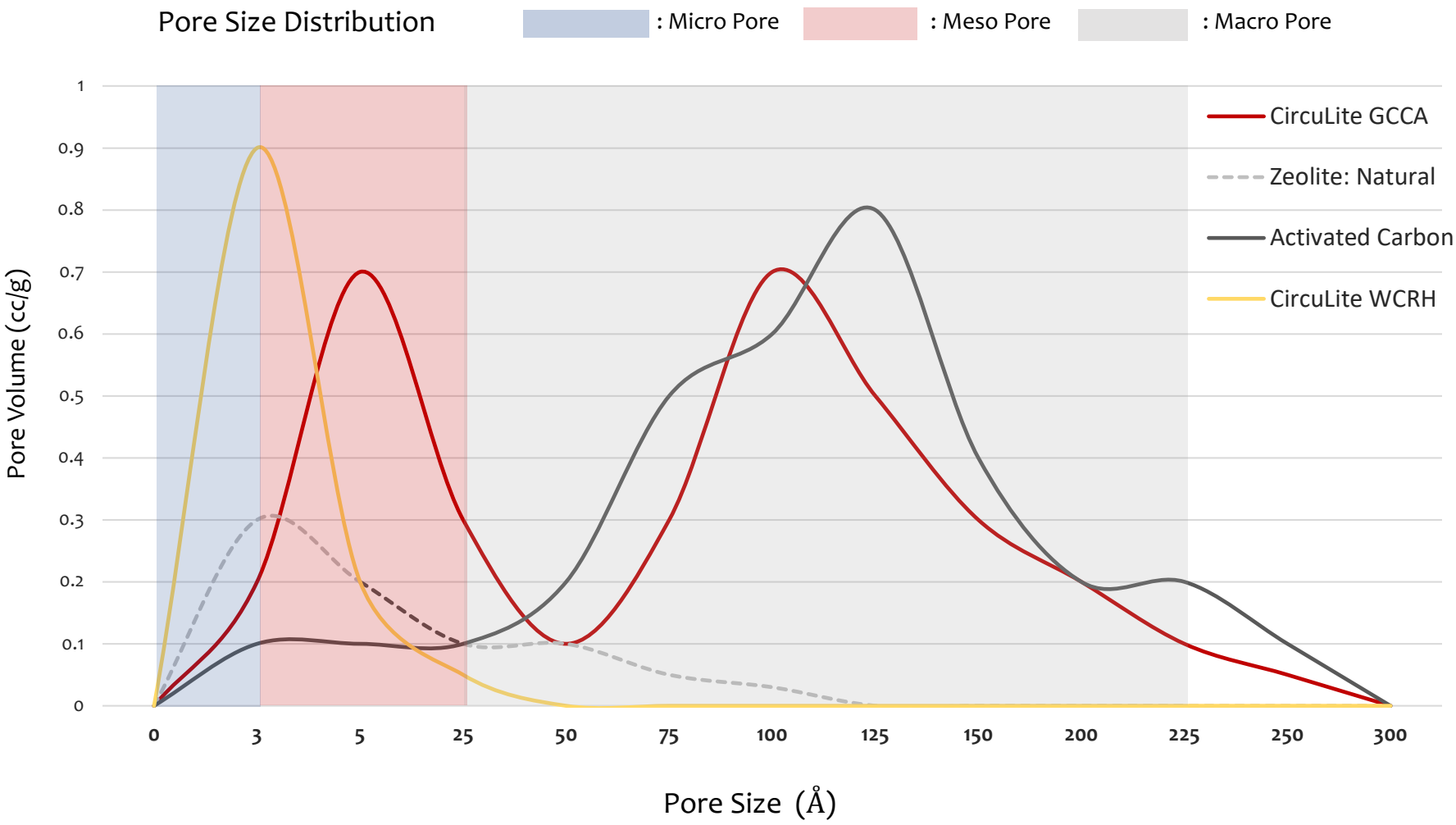
1-3. Application Technology – Available types of Raw Materials as CircuLite

1.	Unused Materials	Coal Ash	Rice Husk Carbide or Ash	Bagasse Carbide or Ash
2.	Producer	- Power Plant	- Biomass Power Plant	- Biomass Power Plant
3.	Main Components	- Silicon, Aluminum	- Silicon	- Silicon
4.	Classification	Fossil Fuel	Renewable Energy	Renewable Energy
5.	Combustion Temp	approx. 1,000 ℃	approx. 800 ℃	approx. 750 ℃
7.	Appearance			
	*Note-01: We can recycle from various Waste Materials to Multi-Functional Material: CircuLite *Note-02: We have a technology to remove the Toxic Materials, Heavy Metals from Coal Ash. Therefore, you can expand the Market for Sustainable, Recycling-Based Society for achieving Goals of SGDs and Next Generations.			

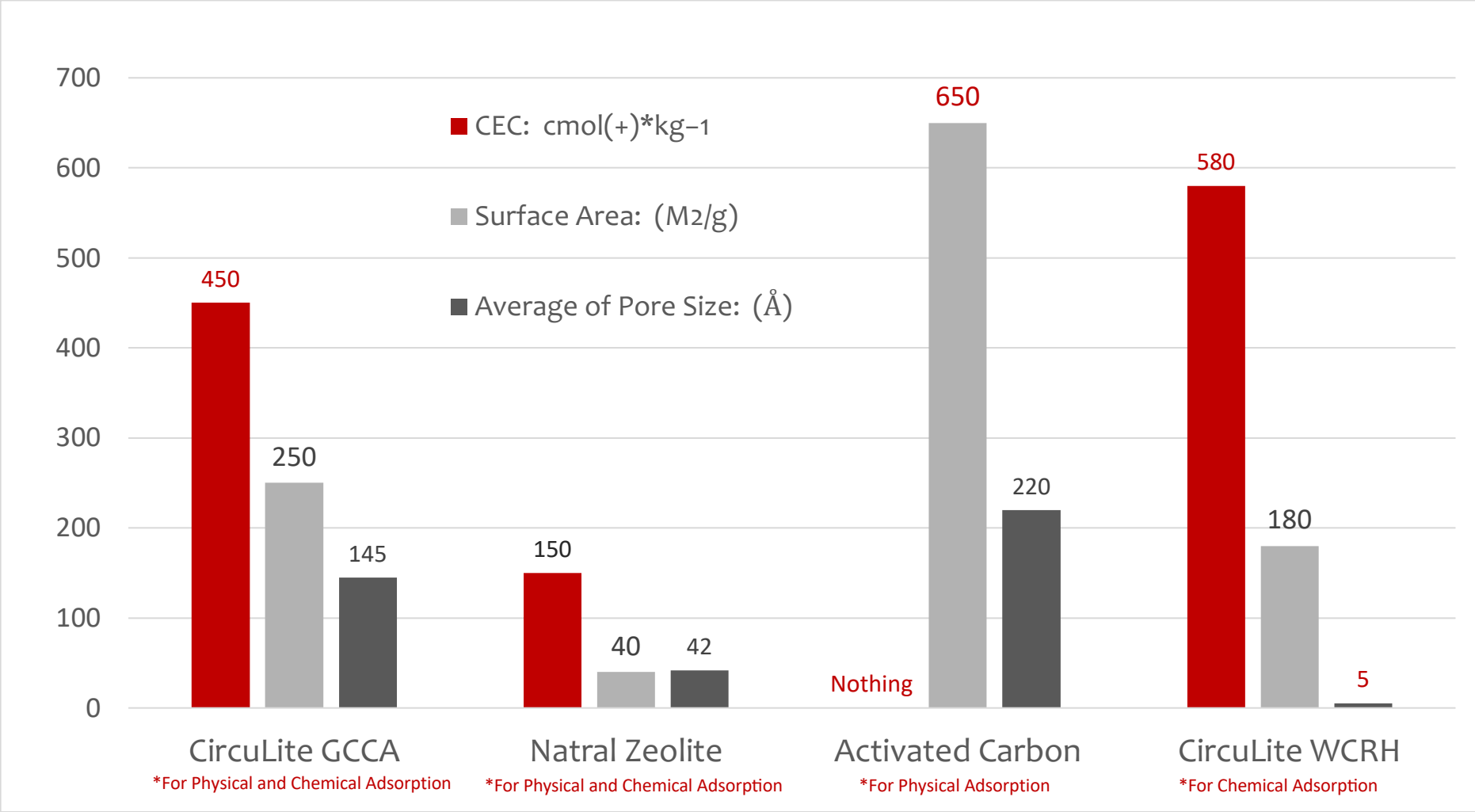
2-1. Technical Data: Comparison table: Performance

No.	Item /Material	CircuLite Recycled Material	Zeolite (Natural)	Zeolite (Synthesis)	Activated Carbon Standard Product
01	CEC [cmol(+) kg^{-1}] *Ion Exchange Capacity	300 ~ 600	200 ~ 250	200 ~ 600	nothing
02	Surface Area (cm2/g)	100 ~ 400	20 ~ 120	80 ~ 200	300 ~ 800
03	Particle Size (mm)	0.003 ~ 0.100	0.001 ~ 2.000	0.002 ~ 0.010	0.1 ~ 20
04	Pore Size, Range (nm)	0.3 ~ 2.5 Micro, Meso, Macro	0.2 ~ 0.3 Micro	0.3 ~ 0.15 Micro	1.0 ~ 3.0 Micro, Meso, Macro
05	Electric Charge (Cation or Anion)	(+) (-)	(-)	(-)	Nothing
06	Oil Absorption Capacity (Against Own Weight: %)	55 – 65	15 - 18	8 - 15	22 - 34
07	Price (US$/ton)	Depend on Production Scale	200 ~ 300	400 ~ 1,000	300 ~ 800

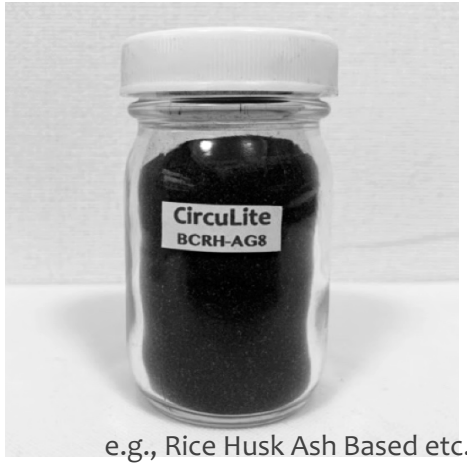
2-2. Technical Data: Comparison table ： Pore Size Distribution



2-3. Technical Data: Comparison of Performance among similarly materials as Adsorbent



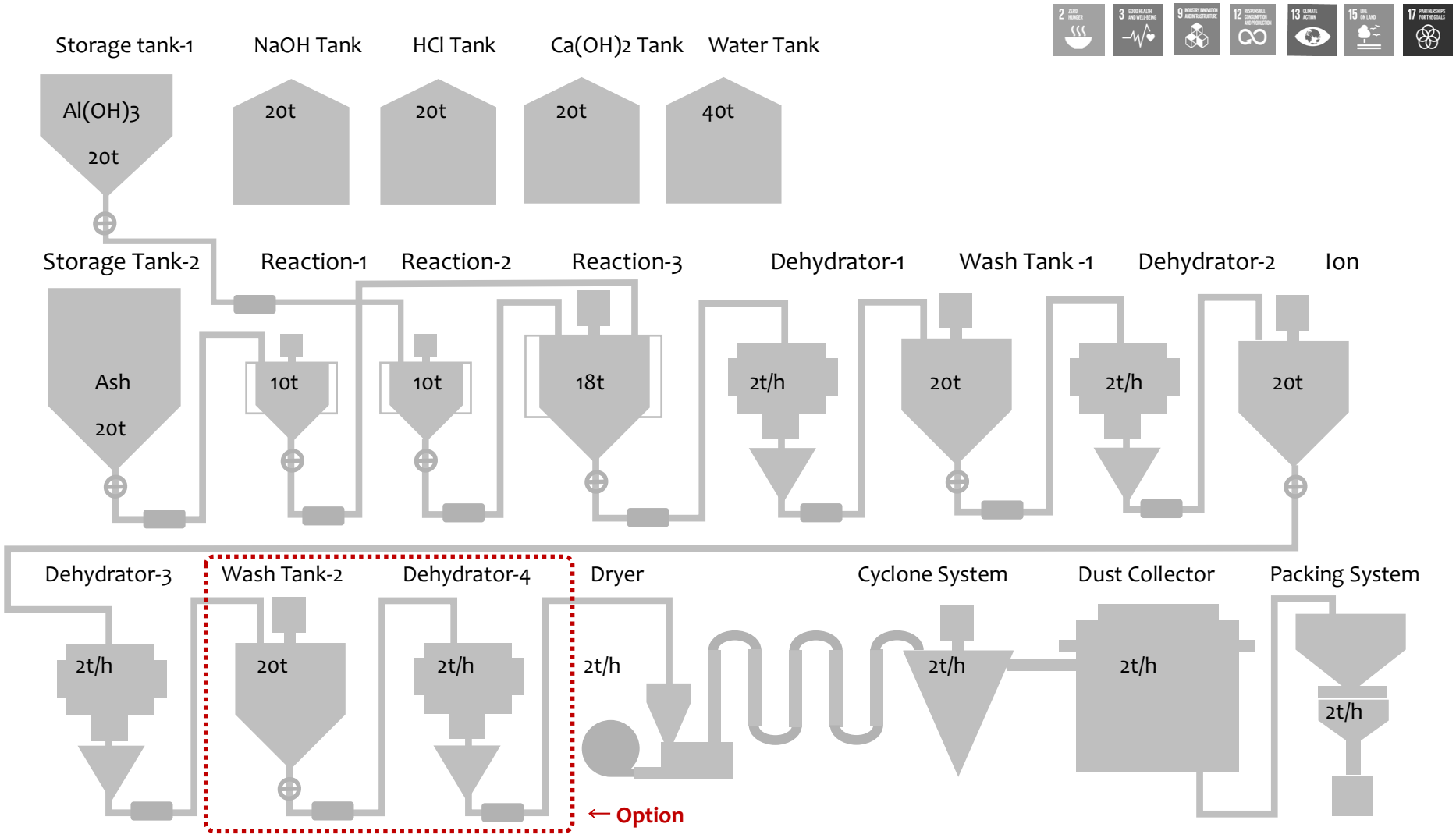
3-1. Application Technology: Types of Products of Recycled Products: CircuLite

1.	Raw Material	Coal Ash, Rice Husk Ash, etc.	Rice Husk Ash, Coal Ash, etc.	Rice Husk Ash, Coal Ash, etc.
2.	Field	- Industrial	- Toxic Gas Remover	- Agriculture
3.	Application	- Wastewater Treatment - Heat Insulation Coating: *Paint - Storage for Battery: *Porous	- Toxic Gas Adsorbent - Removing Heavy Metals - Removing Toxic Materials	- Soil Optimization - Prevent Desertification - Amend Poor Soils
4.	Feature	- ION Exchanger - White Color: for Cosmetic, Medical, Tooth Powder, etc.	- Physical Adsorption: Porous - Chemical Adsorption: Ion^{+} - Substitute for Activated Carbon	- Soil Conditioner - Prevent Desertification - For Economic Agriculture
5.	Price	High Price: White Color	Middle Price: Gray Color	Low Price: Black Color
6.	Appearance *Color Variation ☐ White ▒ Grey ■ Black	 e.g., Coal Ash Based, etc.	 e.g., Rice Husk Ash Based, etc.	 e.g., Rice Husk Ash Based etc.
	*Note: We can recycle from various Waste Materials to Multi-Functional Material: CircuLite			

Section-02

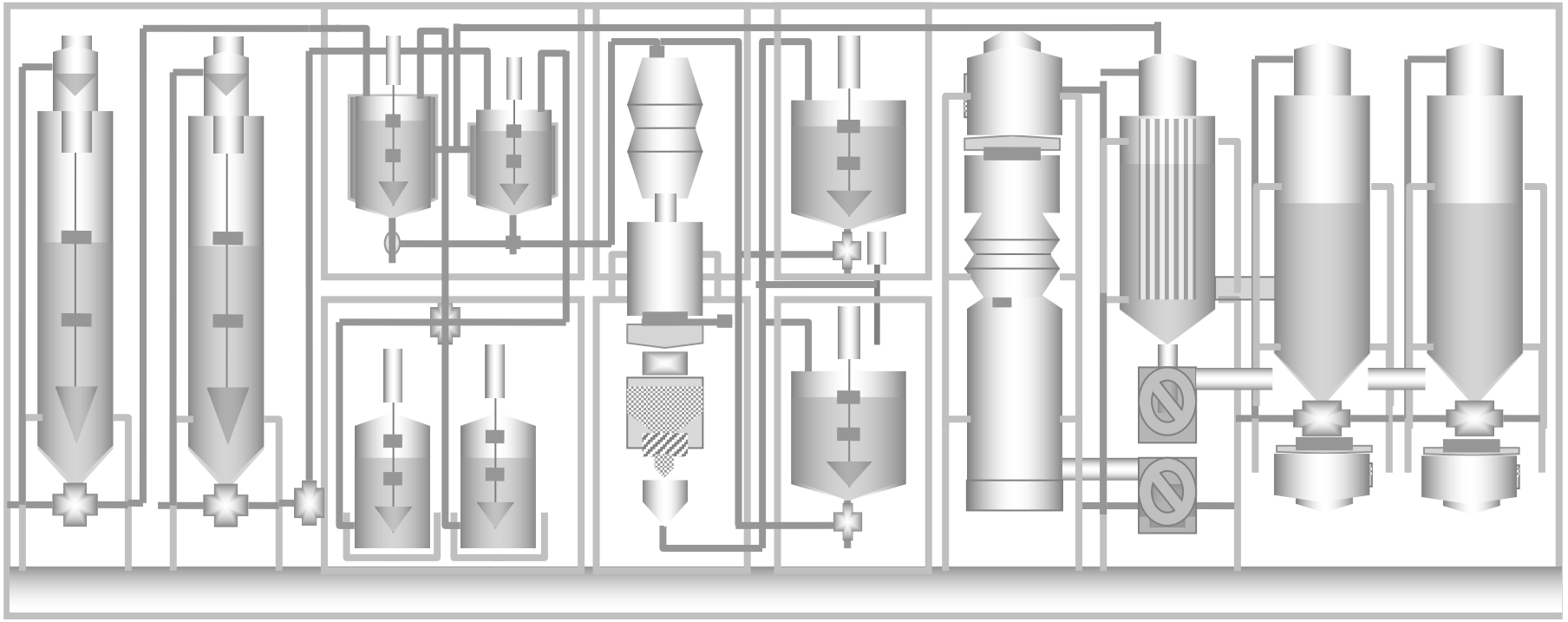
Introduce our Technology

5-1. Outline of **CircuLite** Manufacturing Process



5-2. Outline Equipment for processing of CircuLite

Raw Material	Sub-Material	Reaction-2	Reaction-3	Dehydrate	Washing	Dry	Collector	Product Na	Product Ca
Ash Tank SiO2	Material Al2O3	NaOH H2O Heat	NaOH H2O Others	Remove Na H2O	Remove Na Ion Exchange	Dry	Powder Collector	Type-Na	Type-Ca

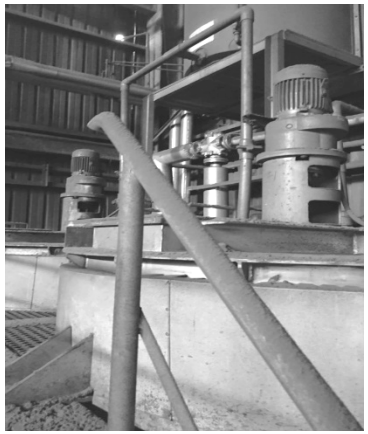


5-3. CircuLite Manufacturing Equipment

Track Record: Case - Raw Material: Rice Husk

Combustion furnace

First Reaction Tank A, B



3rd. Main Reaction Tank

Dehydrator-1

Dehydrator-2

Slurry Plumbing System

Dryer + Power Collector

Electorical Control

Section-03

Introduce Application of CircuLite

6-1. Application Table of CircuLite

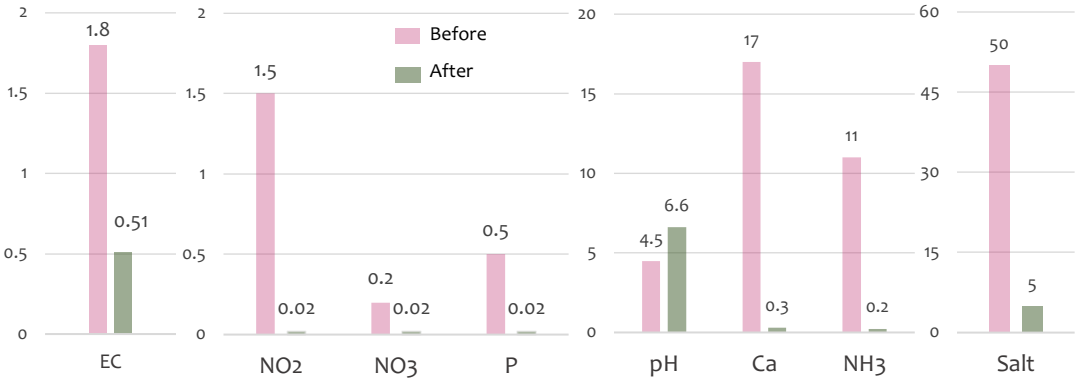
No.	Category	Daily Uses	Industrial Uses	Public Uses
1.	Chemical Adsorption [CEC]	・Water Softeners: Detergent ・Water Purifiers: For Drink ・Detergent: Softening ・For aquarium Fish	・Industrial Waste Water: (Heavy Metal, COD, BOD, Oil.etc.) ・GOLF: Prevent elution Pesticide ・Soil Conditioner: EC, pH, etc.	・River Purify: Concrete ・Water Retaining for Asphalt ・Farm of fish, shrimp ・Polluted Soil: Heavy-Metals, Oil etc.
2.	Physical Adsorption [Porous]	・Deodorant: Restroom ・Air Purifier (HITACHI) ・Dehumidification: Room ・**Cosmetics**	・Deodorant for Industrial ・Remover of Harmful Gases ・Oil Adsorbent: case of emergency ・Breeding Feed: Intestine function	・Soil Decontamination: Cs (Fukushima Radioactive) ・Asphalt: - Permeability - Prevent Heat Island Phenomenon - Prevent Track Digging
3.	Microbe [Bacterium] [Anti-Virus]	・Soil amend for Gardening ・Fermentation Accelerator ・Water Retaining ・Air Purifier: Anti-Virus ・Mask – Filtration, Anti-Virus	・Bio Reactor: Microbe Proliferation ・Soil Amendment: Agrochemical ・Ferment for Compost ・Feed：Cattle, Pig, Chicken ・Feed of farm ：Fish、Shrimp	・Purify of pond, river, sea ・River Biological Diversity ・Biological Reactor
4.	Impregnation	・Aromatherapy (Anti-Virus)	・Secondary Products : Paint, Fabric	・Insect Proof: Mosquito, Mite
5.	Education	・Environmental Study	・Study environmental science	・Environmental Research

6-2. Application: Agriculture - Improving degraded soil by CircuLite

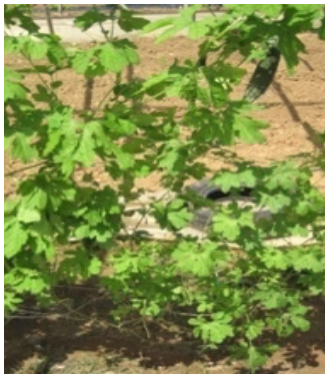
＊Comparative Test：Elution amount of Nutrient Compositions from Soil and its Growth				No. 11-08-0006
＊Test site：Tomori, Miyako Island, Okinawa, Japan			＊Soil Classification：Shimajiri Soil	September 08, 2011
＊Testing Object：Bitter gourd			＊Test Sample：CircuLite BCaRH	S. Kumagai：Sean Inc.

Analysis item		Unit	Blank	Addition
1.	pH	-	4.5	6.60
2.	NH3	mg/L	11.0	0.20
3.	NO2	mg/L	1.5	0.02
4.	NO3	mg/L	0.2	0.02
5.	Salt	mg/L	50.0	5.00
6.	P	mg/L	0.5	0.02
7.	Ca	mg/L	17.0	0.30
8.	EC	mS/cm	1.8	0.51

Elution amount of Nutrient Compositions from Soil



Addition: **10 vol.%**



Addition: **5 vol.%**

Addition: **3 vol.%**

Addition: **2 vol.%**

Addition: **0 vol.%**

Initiative：ICT Agricultural Circular Economy System by Recycled Functional Material: CircuLite

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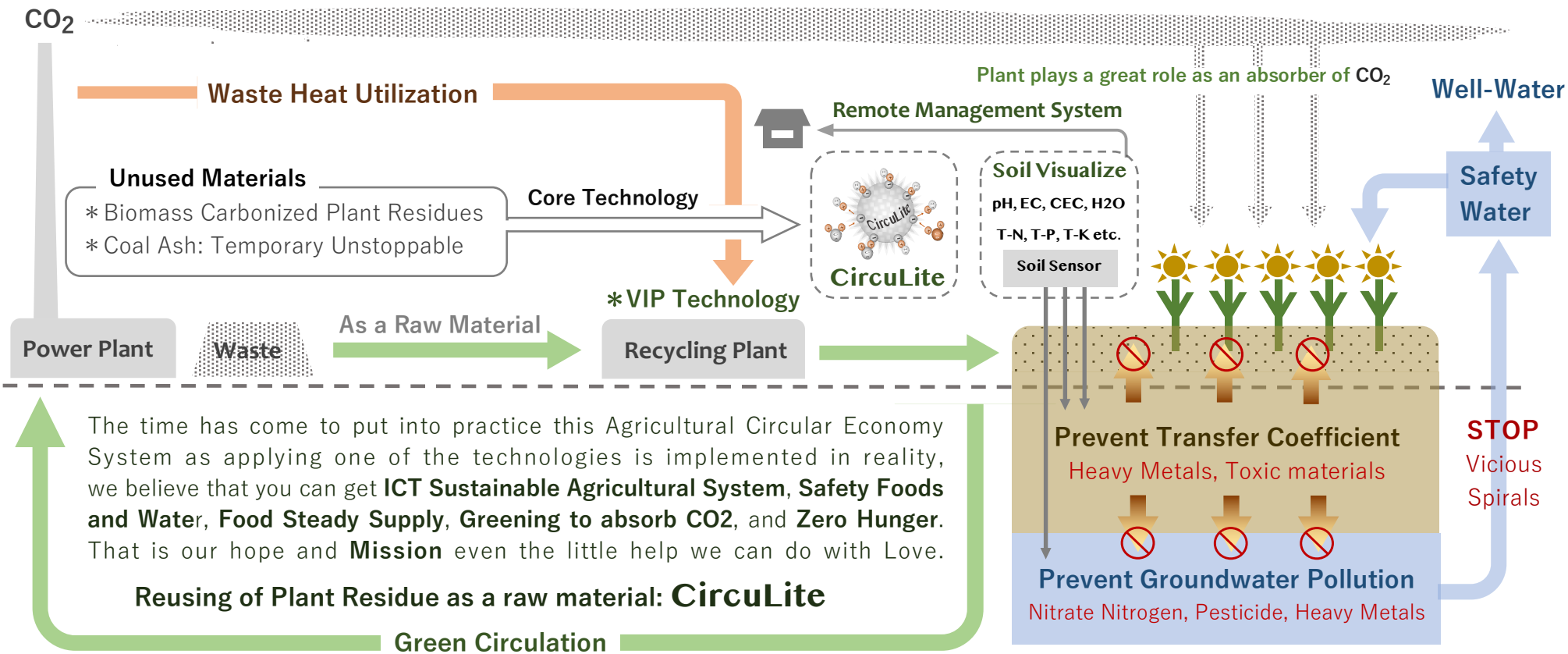
To Provide Composite Agricultural Impacts and Rational System：As a Venous Industry

ICT Administrate Agri-Factory Systems by recycled Local Waste



The time has come to put into practice this Agricultural Circular Economy System as applying one of the technologies is implemented in reality, we believe that you can get **ICT Sustainable Agricultural System**, **Safety Foods and Water**, **Food Steady Supply**, **Greening to absorb CO2**, and **Zero Hunger**. That is our hope and **Mission** even the little help we can do with Love.

Reusing of Plant Residue as a raw material: CircuLite

A

Solve the Local Issues By Recycled Local Waste

Utilized Local resources for solutions in Local area

B

Prevent Transfer Coefficient

Pesticide, Heavy Metals, Radioactive Substances

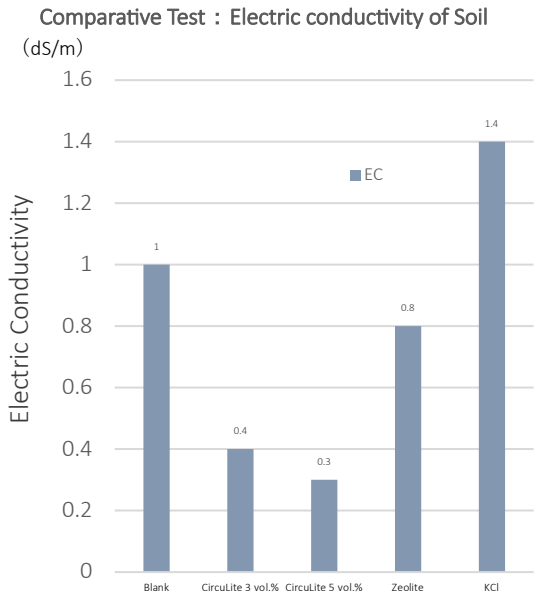
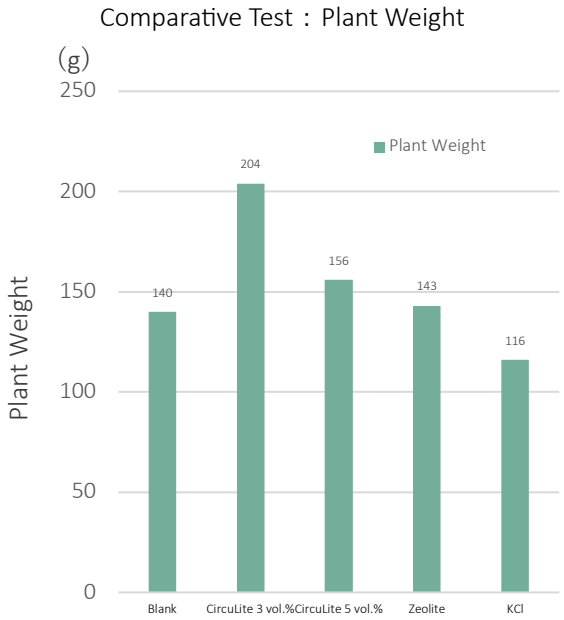
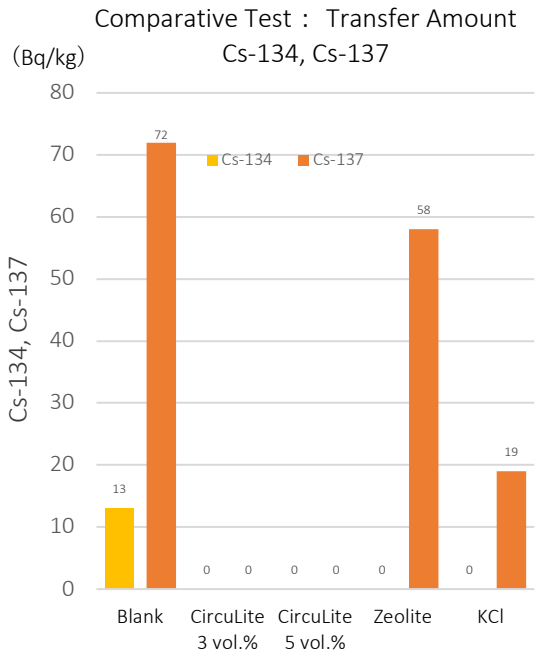
C

Ground Water Contamination Control

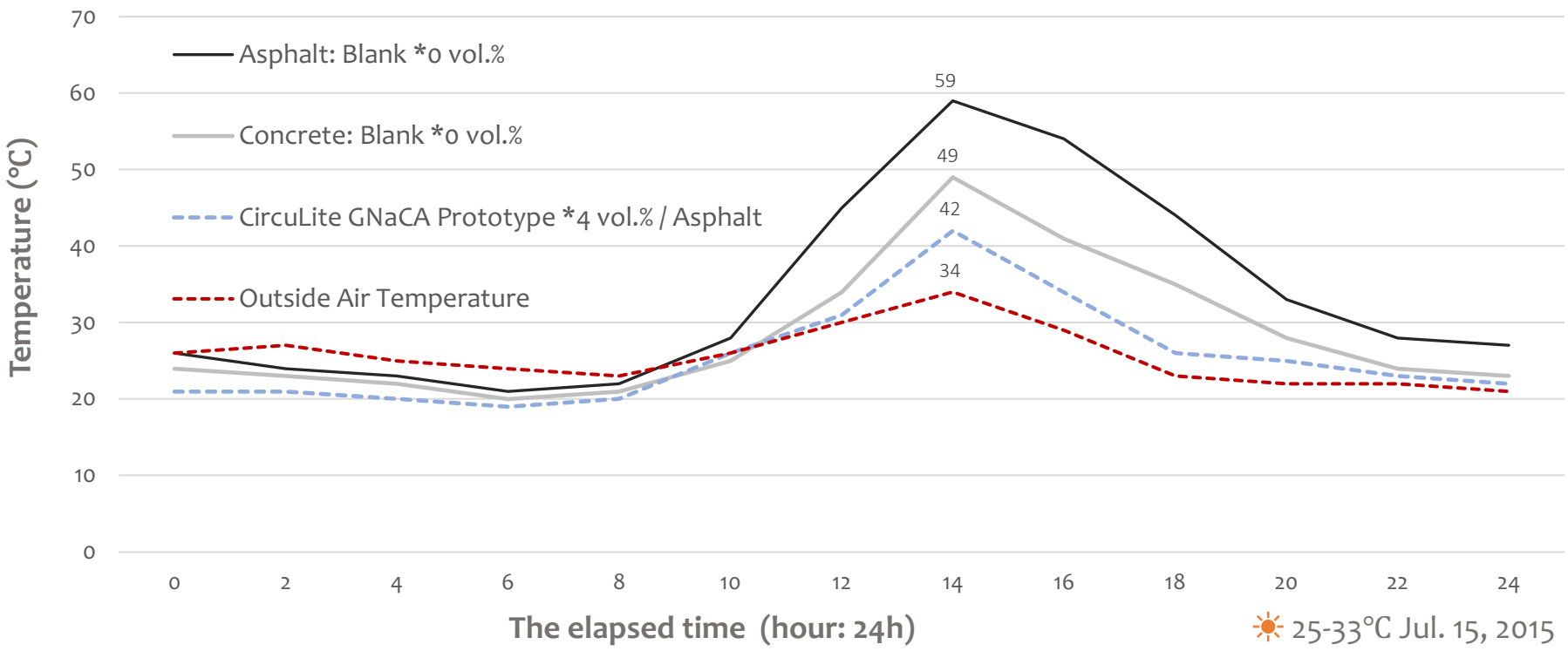
Nitrate Nitrogen, Pesticide, Heavy Metals, etc.

6-4. Application: Soil Decontaminate Test: Radioactivity Contaminated Soil

＊Testing Object：Bitter gourd ＊Test Sample : CircuLite BCaRH ＊Contaminated Material: Cs-134, Cs-137

Test of Effect EC of contaminated soil	Test of crop growth for add CircuLite	Test of Adsorptive immobilization: Cs
 Experimental Plot	 Experimental Plot	 Experimental Plot
Soil improvement for EC of Soil using CircuLite mixed in soil.	Soil improvement for crop growth using CircuLite mixed in soil.	Prevent to transfer coefficient Cs from radioactive contaminated soil.

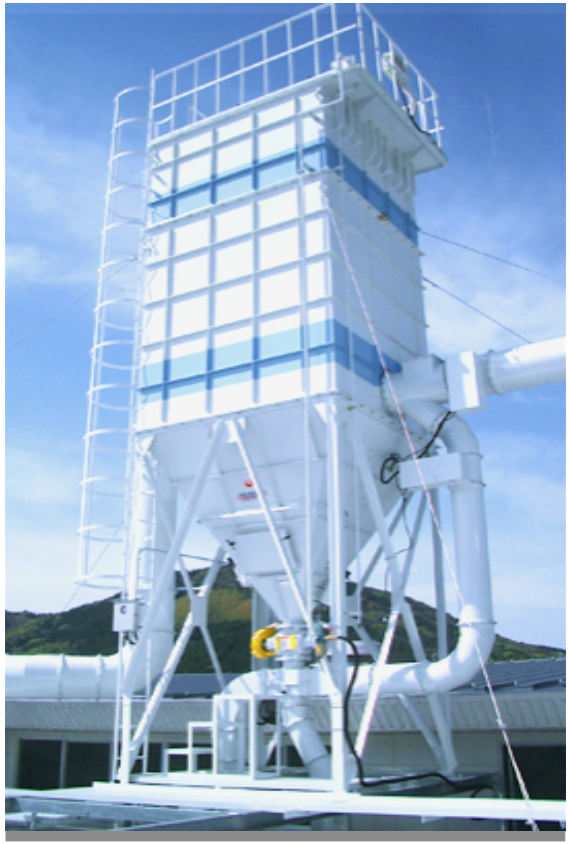
6-5. Application: Change of temperature of Surface on the Road Bed Materials



Keyword： Porous, Water holding property, Heat of vaporization, Heat island phenomenon

6-6. Application：Harmful substances and Toxic Gas Removal System for Industry.

Appearance of Removal System

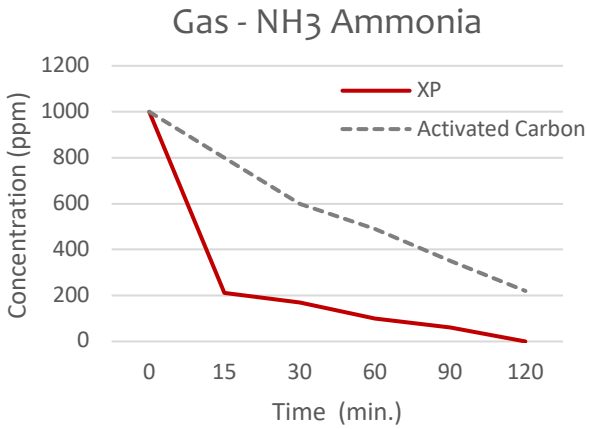


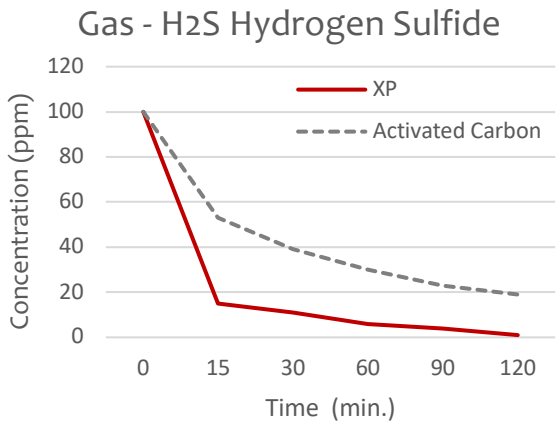
Removable substances and gas by CircuLite

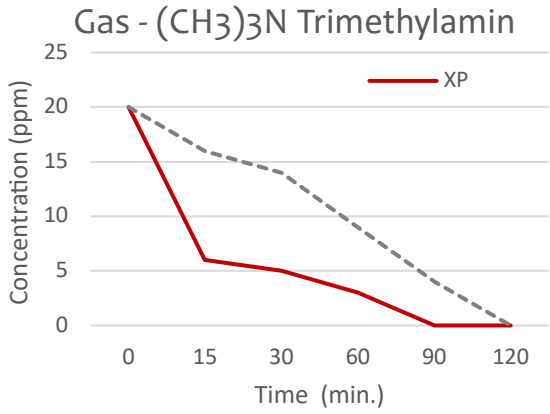
No.	Case: Object Toxic Gases	Chemical Formula
1.	Ammonia	NH3
2.	Methyl Mercaptan	CH4S
3.	Hydrogen Sulfide	H2S
4.	Methyl Sulfide	C_2H_6S
5.	Trimethylamine	C_3H_9N
6.	Acetaldehyde	C_2H_4O
7.	Styrene	C_8H_8
8.	Phenol	C_6H_6O
9.	TDI: Toluene Diisocyanate	$C_9H_6N_2O_2$
10.	MDI: Methylenediphenyldiisocyanate	$C_{15}H_{10}N_2O_2$
11.	Toluene	C_7H_8
12.	Xylene	$(CH_3)_2C_6H_4$
13.	Acetaldehyde	C_2H_4O
14.	Sulfur Dioxide	SO2
15.	Carbon Monoxide	CO
16.	**Oil Mist**	**Fuel Oil, Lubricating Oil, Hydraulic Oil**
17.	Fume	Compound of Pb, Hg, Cd, Cu
18.	VOCs	Volatile Organic Compound Group

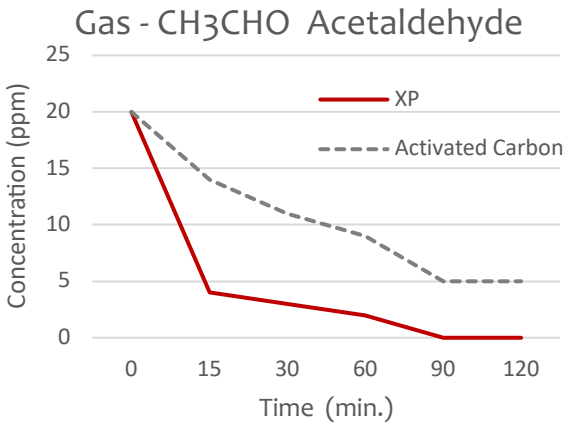
*CircuLite Market is increasing as Industrial Adsorbent in over than seven hundred factories in the world.

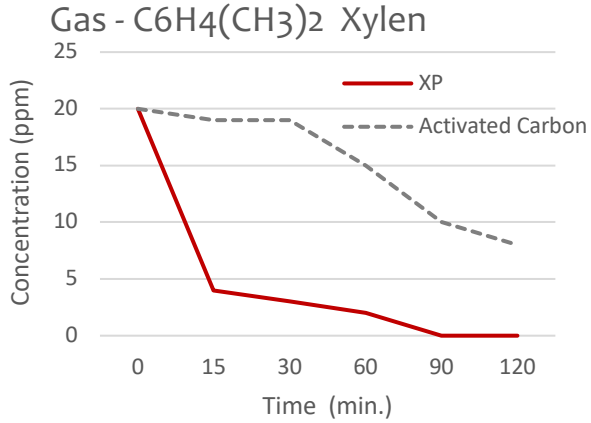
6-7. Application: Odor Deodorant & Purify in Industrial Field

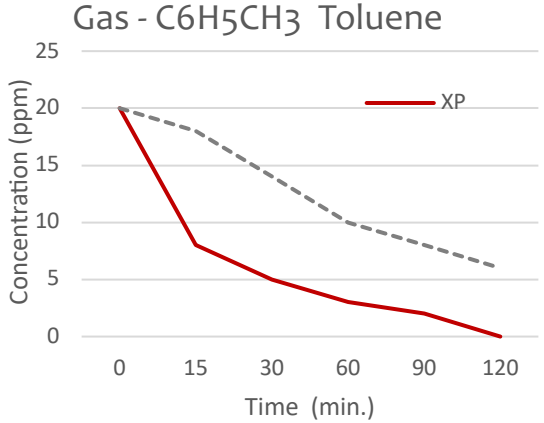








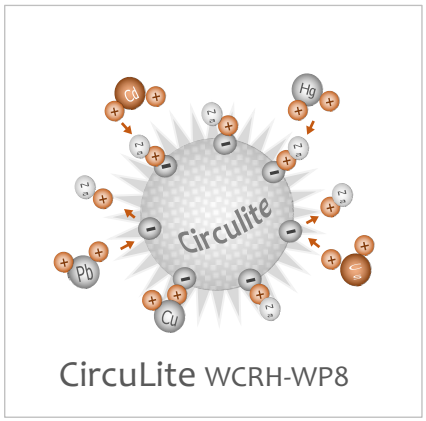




6-8. Application : Wastewater Purification in Industrial Field

CircuLite WCRH-WP8

Enlarged Figure

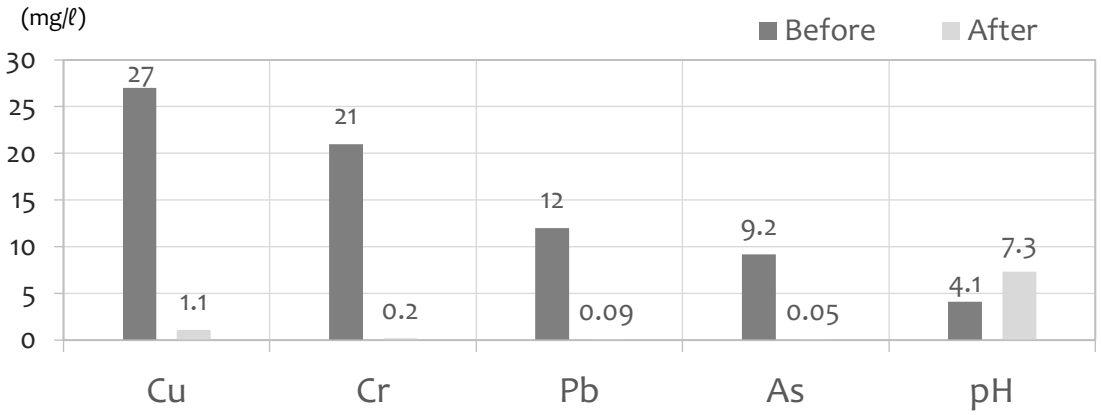


CircuLite WCRH-WP8

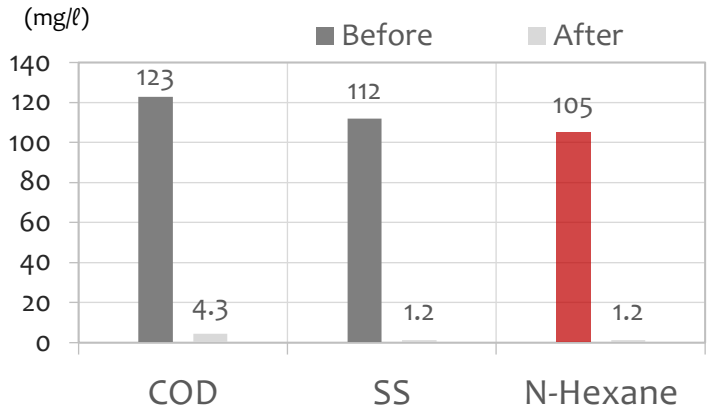
Before

After

Result: Waste Water Purification
By CircuLite WP-WCRH-WP8



Result: Waste Water Purification
By CircuLite WP-WCRH-WP8

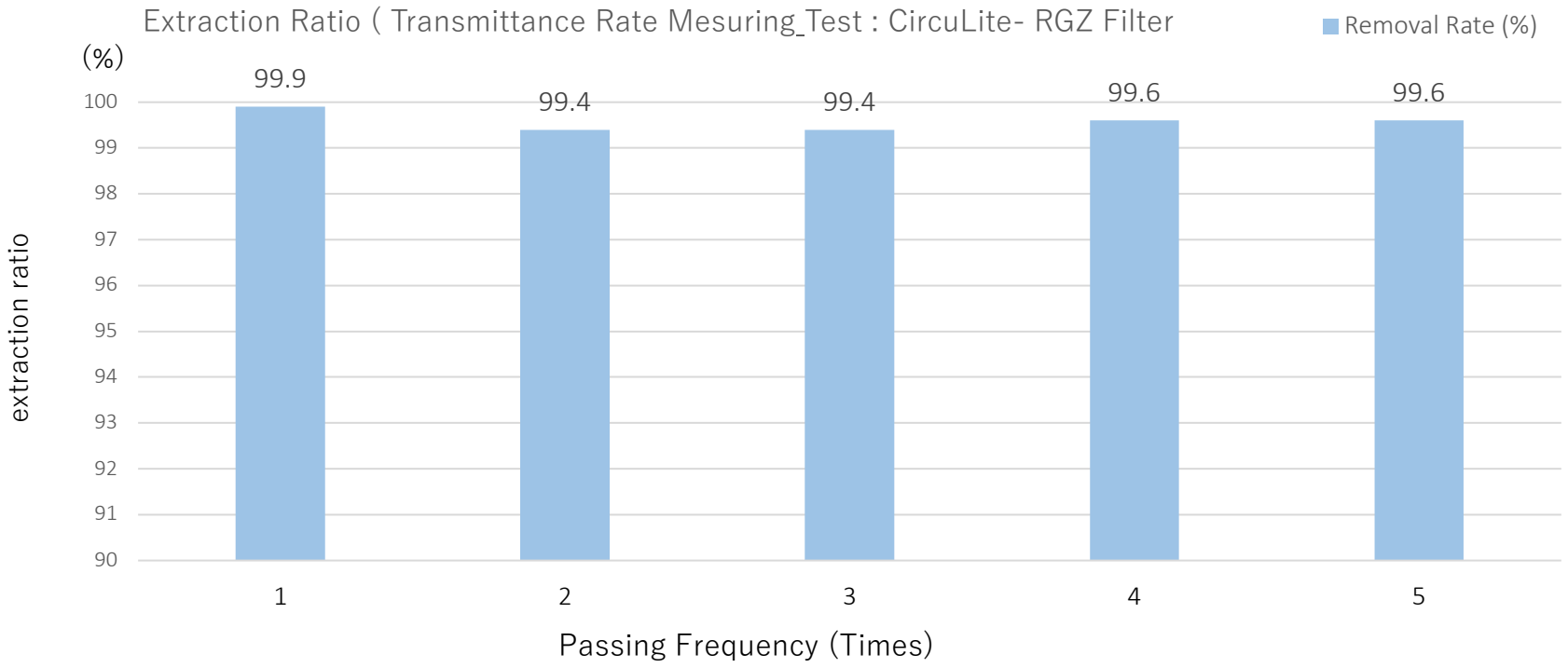


6-9. Application: Anti-Bacterial Material – Non-Woven Material with CircuLite – RGZ JIS K 3703-3:2008

＊Testing Object：**Staphylococcus Aureus** - JIS K 3703-3:2008

＊Test Sample : CircuLite RGZ ＊Processing Material: Non-Woven Fabric with **CircuLite RGZ**

Test of Effect EC of contaminated soil



*Analysis Method: CNS 14774 T5017-2011 9.2, CNS 14775 5017 – 2003, *Test Area: 39.5 (cm2),
* Average Particle Diameter: 2.8 (μ m), *

7-1. Procedure: About the Evaluation of this Business Potential by processing of graded steps

*	Sections	Action Matters		Evaluation items		2019												Expense Items (Unit: USD)	
						1	2	3	4	5	6	7	8	9	10	11	12		
A	Phase - 1	1.	Conclusion Basic Agreement	1.	CEC													1.	Technical Processing Fee
		2.	Delivery of Unused Material: 2 kg	2.	XRD													2.	Basic Analysis Fee
		3.	Analysis Residues	3.	SEM													3.	Personnel Fee
		4.	Evaluation Residues	4.	Safety													4.	Report Documentation Cost
		5.	Evaluation Product	5.	Component														
		6.	Comprehensive Possibility Study	6.	Pore Size Distribution														
				7.	Specific Gravity														
				8.	Particle Size Distribution														
				9.	Analysis for Safety														
				10.	Report Documentation, Briefing Session													Total:	
B	Phase - 2	1.	Research of Facilities	:	High Quality, Low Cost													1.	Research of Facilities Fee
		2.	Instruction of Machinery Technology	:	Disclose the Know-How in details													2.	Technical Instruction Fee
		3.	Inspection Manufacturer Factory	:	Three Members													3.	Personnel Fee
		4.	Collection of Estimates	:	Basically, Procure in Local, Taiwan, etc.													4.	Transportation Expenses
		5.	Calculation Cost for Business	:	Evaluation of Profitability													5.	Calculation Cost Fee
		6.	Report Documentation	:	Report Documentation, Briefing Session													6.	Report Documentation Cost
																		Total:	
C	Phase - 3	1.	Survey Local Conditions	1.	Infrastructure, Water, Electricity, Site, etc.													1.	Survey Cost
		2.	Structure Local Business Formation	2.	Government, Company, University, etc.													2.	Personnel Fee
		3.	Raising Funds	3.	Public Budget, Bank, etc.													3.	Transportation Expenses
																		Total:	
D	Phase - 4	*	Conclusion Technical Contract		Technical Transfer Fee, etc.														

Introduction: Personal History

■ NAME (Technical General Manager)：Shunsuke KUMAGAI - Live in Tokyo, Born in Fukuoka, Japan, raised in Nagano

■ Registrate Qualification：Environmental Consultant – Registered by Department of Environment of Japan

■ Academic Background

1. Ehime Univ.: Agriculture Trainee Class - Synthesis of Functional Compound Material to utilize Residues.
2. Waseda Univ.: Human Environmental Science Dept. - Global Environmental Science Subject.

■ Main Career

Shunsuke KUMAGAI

1. Practical Use 1. Circular Economy Business: Factory of Recycling Coal Ash Based（Chubu Electrical Power, Japan）
2. Practical Use 2. Circular Economy Business: Factory of Recycling Rice Husk Ash Based（Fujian Province, China）
3. Japan Forestry Agency - Hazardous Materials R&D Insect Pest Control（Subsidy of Research）
4. Yokohama City Government - SBIR（Subsidy of Implementing – R&D Recycling of Sewage Sludge Ash）
5. R&D Project 1: Purification of the type of Closed Water Area（Research Funds - Yokohama City Association）
6. R&D Project 2: Dustproof & Anti-weed of Ground（Research Funds - Yokohama City Association）
7. R&D Project 3: Purification of the type of Biodiversity of Closed Water Area（Research Funds - Yokohama City Association）
8. R&D Project 4: R&D of Environmental Education Tools and Method（Research Funds - Gakken Holdings）
9. R&D Project 5: Toxic Gases Removal Equipment for industrial（Collaborate R&D: AMANO, HITACHI, FUJITSU）
10. R&D Project -5‥Industrial Wastewater Treatment (Heavy Metal, Oil content)
11. Research-1‥Prevent method of Contaminate Underground Water for vicious circle of chemical elements from poor soils.
12. Research-2‥Improvement methods of Subsurface Soil Quality to adsorb the effective fertilizer from Red Soil. (Okinawa Pref.)
13. Research-3‥Developed New Materials to Recycle method of unused resources (Taiwan National Science Technology Univ.)

■ Activities for Environment for SDGs

1. Environmental Technology Transfer（Contribute for World Environmental Solutions）: Asia, US, etc. with UNIDO
2. Decontamination of Fukushima: Water purification and Soil Decontamination, Volume Reduction (Ministry of Agriculture, Japan)
3. Environmental Education for Developing countries: Solomon (Technical Personnel Dispatching - JICA)
4. New Functional Materials recycling unused residues: R&D: International Patent Application within 2020.
5. Registered Environmental Technology by UNIDO of United Nation.
6. R&D: Pest Repellent for Mosquito, Mite, Leech, etc. (Collaboration Funds by Private Company)
7. R&D: Recycling Method of Plant-Based Residues (Malawi, Côte d'Ivoire, Morocco, Hong Kong, Cambodia, Myanmar,)

Thank you very much for your kind attention!

Sean Shunsuke KUMAGAI

Environmental Counselor: Ministry of Environmental of Japan 🇯🇵

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