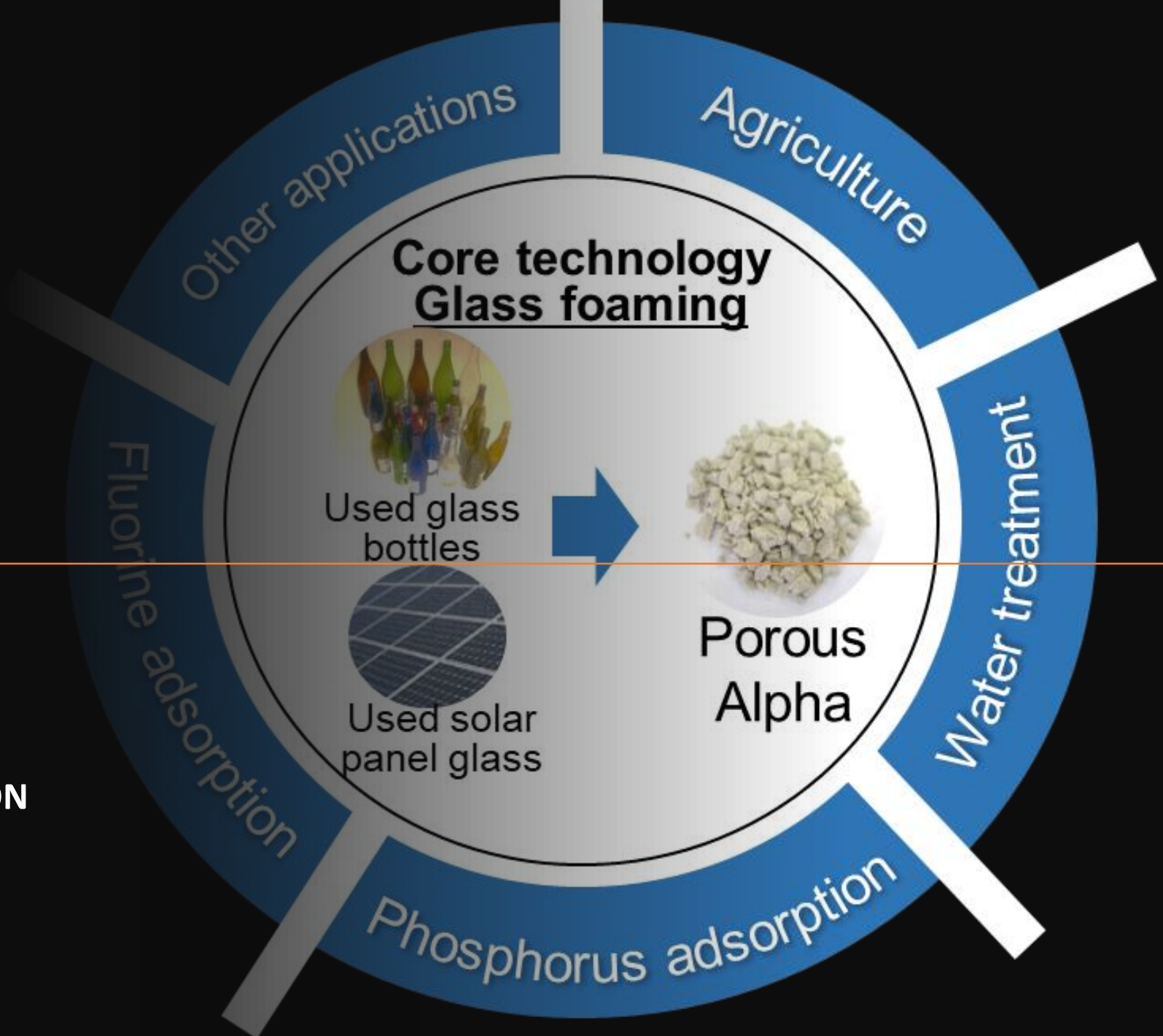


Porous Alpha

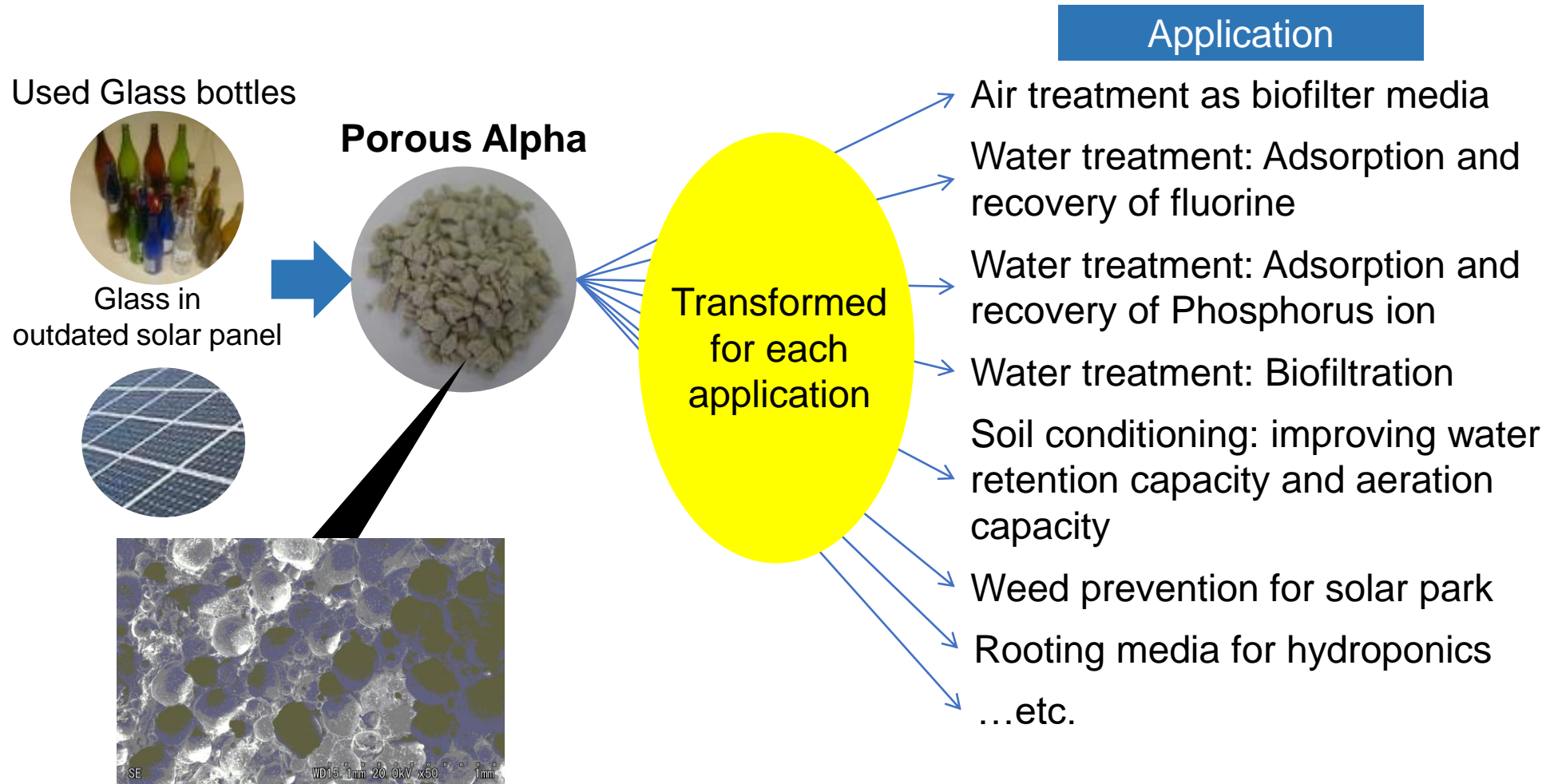
ONE SOLUTION

MULTIPLE APPLICATIONS

WATER TREATMENT: BIOFILTRATION

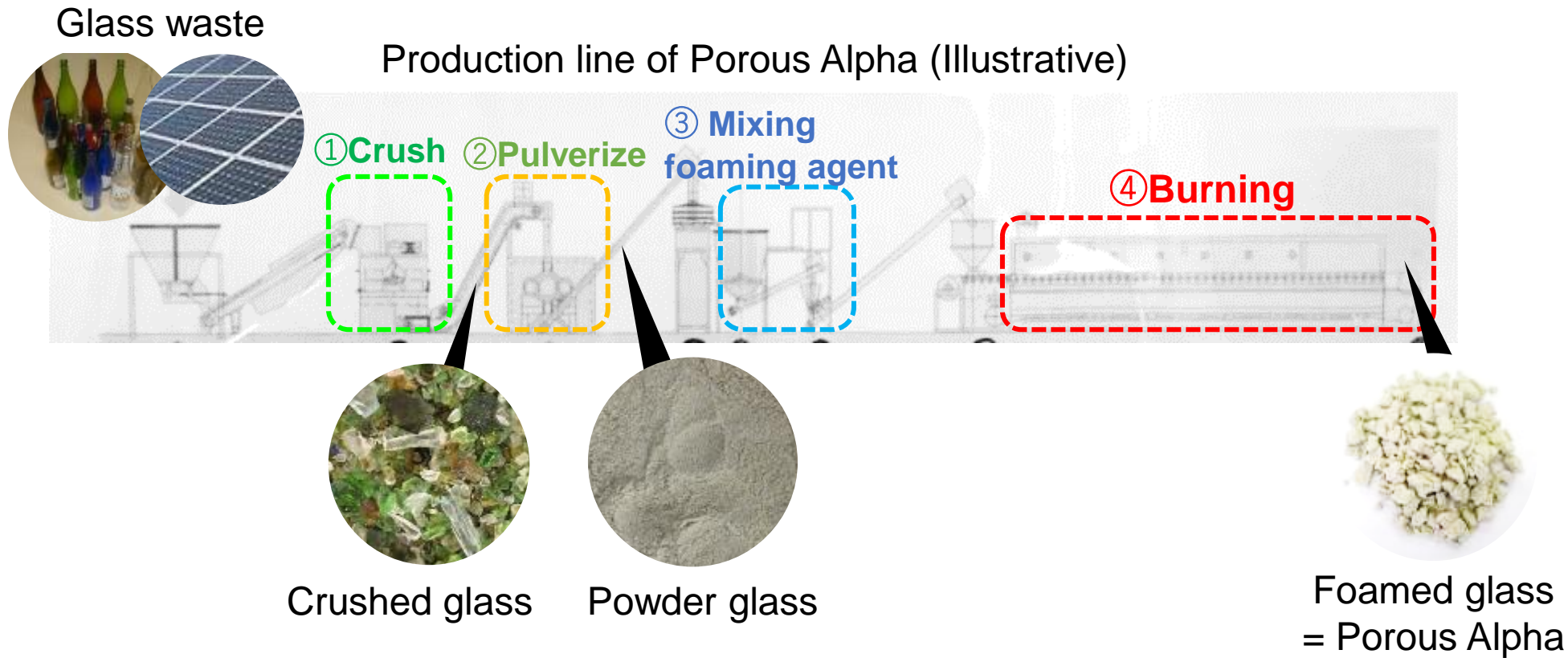


Our technology is centered at foamed glass “Porous Alpha” from used glass, developing its application



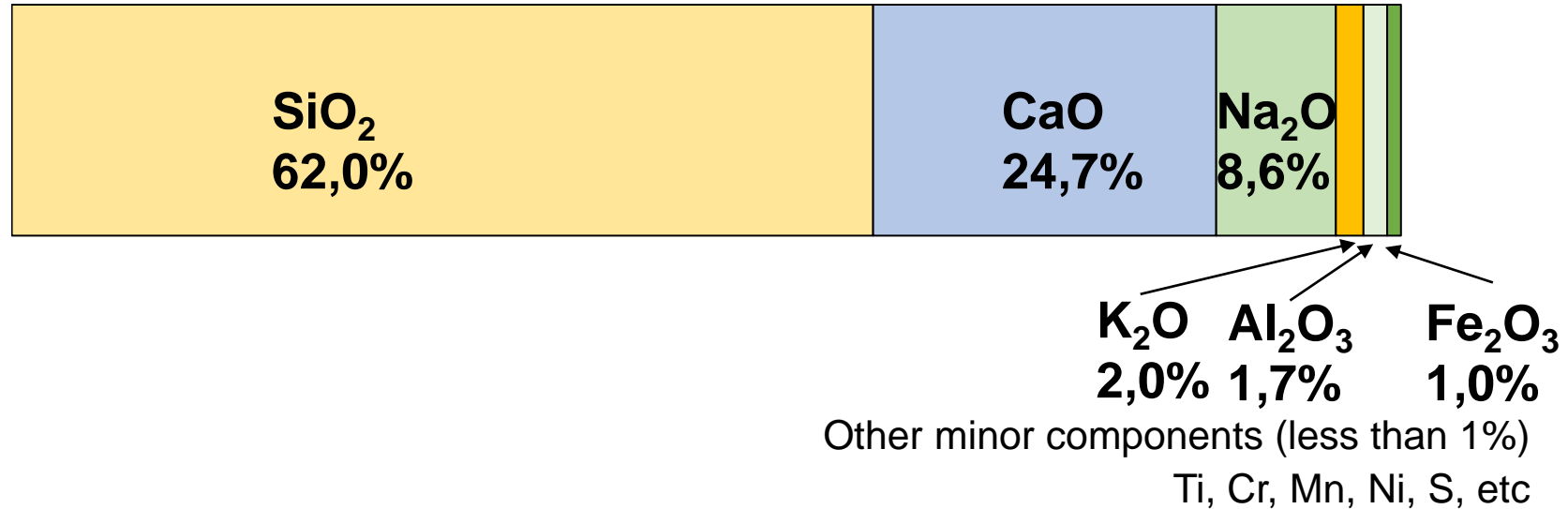
Electron microscope image of Porous Alpha

Porous Alpha is made by burning of mixture of pulverized glass and foaming agent

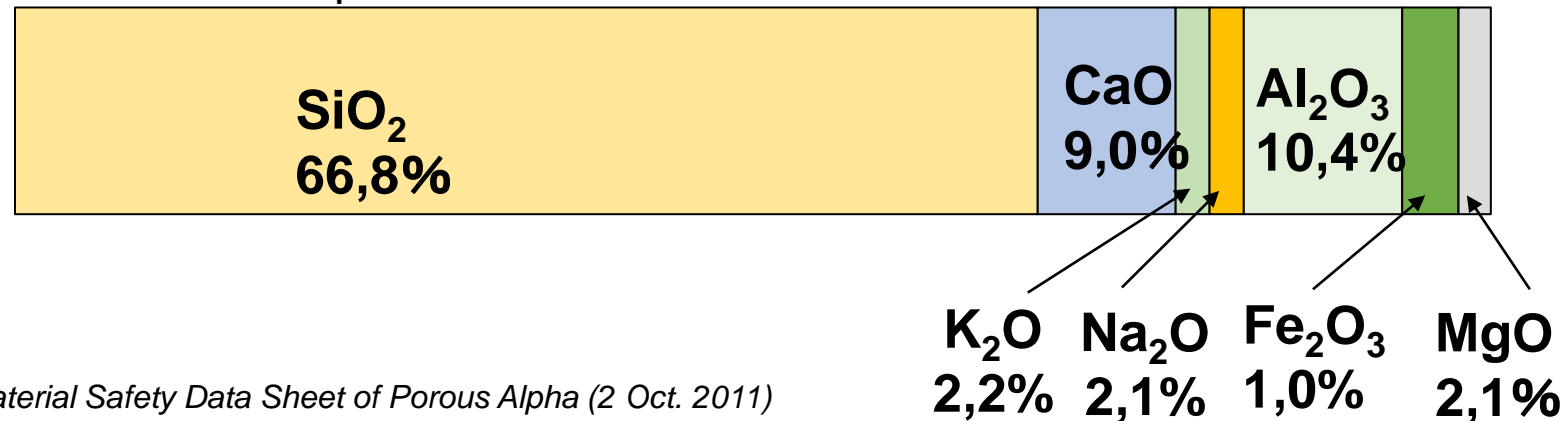


Porous Alpha is mainly composed of silica and calcium oxide, similar to the chemical composition of natural sand

Main chemical composition of Porous Alpha*



Chemical composition of natural sand in Taklamakan Desert in China



* Material Safety Data Sheet of Porous Alpha (2 Oct. 2011)

Physical characteristics is as follows

Based on Material Safety Data Sheet of Porous Alpha , Oct 2011

- Visual appearance: Achroma or light green etc.
- Odor: Odorless
- True density: ca 2,5 g/cm³
- Size density: 0,9 ≈ 1,2 g/cm³
- Grain size: 50 ≈ 2.000 μm (Median 700μm)
- Grain shape: Abrasive infinite shape
- pH: Max. pH 10,3 or pH 7(after water washing)
- Solubility: Not identified
- Softening temperature: 720 ≈ 730°C(unresolved)
- Volatile: not identified



Porous Alpha has three uniqueness which are the base for our diversified applications

Uniqueness	Competitors' products	Merit by the uniqueness
<p>1 No-elution of heavy metal</p>	<p>Heavy metal elution is not avoidable</p>	<ul style="list-style-type: none"> ▶ Range of acceptable raw material (glass) is wider than competitors' products ▶ Widen range of application by safety nature <ul style="list-style-type: none"> - Usable for agriculture as soil conditioner - Not contaminating the treated water when used as water treatment agent
<p>2 Coexistence of Interconnected and closed pore</p>	<p>Only closed pores</p>	<ul style="list-style-type: none"> ▶ Possible to contain diversified matter and microbes <ul style="list-style-type: none"> - Diversified microbes for deodorizing - Water and air for soil conditioner ▶ Air and water are permeable <ul style="list-style-type: none"> - Perform as water treatment agent by sinking in water
<p>3 Adjustable specific gravity and pore size</p>	<p>Constant specific gravity</p>	<ul style="list-style-type: none"> ▶ Adjustable to the requirement by application and environment

Under the Japanese regulation, Porous Alpha can be used as a soil for agriculture without environmental impact

Result of leaching test based on the “Environmental regulation regarding the soil pollution”, 23 August 1991, Ministry of Environment, analyzed by Tottori Health Association

No.	Item	Result	Criteria
1	Alkyl mercury	Not detected	Not detected
2	Total mercury	< 0,0005 mg/l	0,0005mg/l
3	Cadmium	< 0,001 mg/l	0,01mg/g
4	Lead	0,001 mg/l	0,01mg/l
5	Organophosphorus	Not detected	Not detected
6	Hexavalent chromium	0,014mg/l	0,05mg/l
7	Arsenic	< 0,001mg/l	0,01mg/l
8	Total cyanogen	Not detected	Not detected
9	PCB	Not detected	Not detected
10	Trichloroethylene	< 0,03 mg/l	0,03mg/l
11	Tetrachloroethylene	< 0,01 mg/l	0,01mg/l
12	Dichloromethane	< 0,02 mg/l	0,02mg/l
13	Carbon tetrachloride	< 0,002mg/l	0,002mg/l
14	1,2 – Dichloroethane	< 0,004 mg/l	0,004mg/l

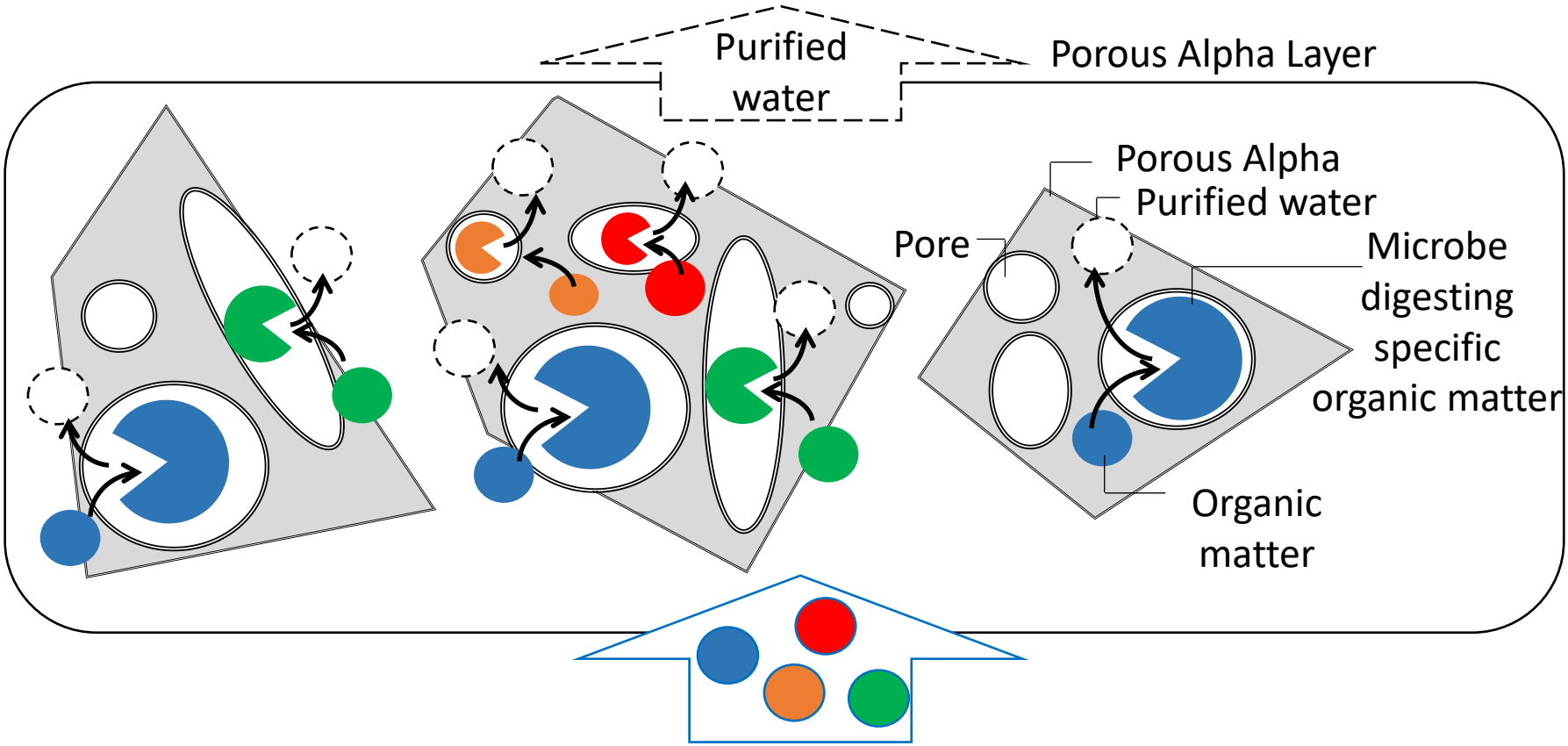
No.	Item	Result	Criteria
15	1,1 – Dichloroethane	< 0,02mg/l	0,1mg/l
16	Cis1,2 – Dichloroethylene	< 0,04 mg/l	0,04mg/l
17	1,1,1 – Trichloroethane	< 0,3 mg/l	1mg/l
18	1,1,2 – Trichloroethane	< 0,006 mg/l	0,006mg/l
19	1,3 –Dichloropropene	< 0,002 mg/l	0,002mg/l
20	Thiuram	< 0,006 mg/l	0,006mg/l
21	Simazine	< 0,003 mg/l	0,003mg/l
22	Thiobencarb	< 0,02 mg/l	0,02mg/l
23	Benzene	< 0,01 mg/l	0,01mg/l
24	Selenium	< 0,001 mg/l	0,01mg/l
25	Fluorine	< 0,08 mg/l	0,8mg/l
26	Boron	< 0,1 mg/l	1mg/l
27	Copper	< 0,5 mg/kg	125mg/kg

Water treatment by bio-filtration suits to purify the water in livestock industry, lake, reservoir and aquaculture

- Water pollution takes place in many places, including untreated wastewater from livestock barn and from food processing factory, which results in eutrophication in lake, reservoir.
- The water pollution in aquaculture farm is also another issue which directly impacts on the productivity of the farm. Diseases from water contamination can critically damage the business.
- **Porous Alpha** with microbe which decompose organic matter can offer the water quality improvement.



Porous Alpha works as biofilter for water treatment

Conceptual image of decomposition of organic matter in the water



Water containing various kinds of organic matters

Advantage of Porous Alpha as media for biofiltration is the durability and diversity of pores

Competitors	Plastic media	Wood chip
<p>Images</p>		
<p>Mechanism and issues</p>	<ul style="list-style-type: none"> ▶ Plastic material ▶ The spaces in the material are the living space for microbes ▶ One material has one form and space, the types of microbes which can work in each material is limited ▶ It's necessary to combine various types of media to decompose various types of element 	<ul style="list-style-type: none"> ▶ Wood material ▶ Microbes live in the wood chip ▶ As wood chip is organic material, it can be decomposed by the microbes ▶ As time passes, the wood chips collapses due to the weight of material itself ▶ It is necessary to replace the wood chip every other year
<p>Advantage of Porous Alpha</p>	<ul style="list-style-type: none"> ▶ Diversified form and size of pores in Porous Alpha can serve as living space for various types of microbes ▶ Various types of elements can be decomposed only with Porous Alpha 	<ul style="list-style-type: none"> ▶ Porous Alpha can work more than 10 years without replacement, as Porous Alpha is not bio-degradable or not fragile to weight

The wastewater of 8 tons/day from poultry farm is treated. BOD is reduced from 1.620 ppm to less than 10 ppm

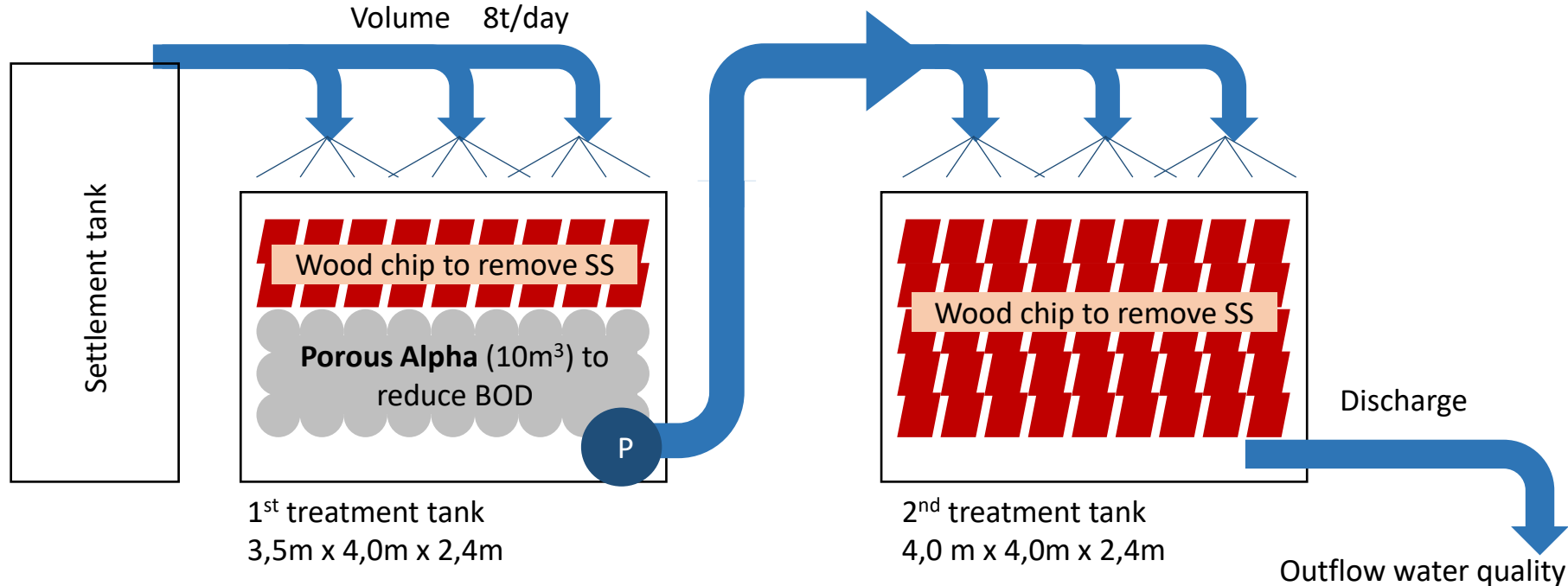
Case study: Wastewater treatment system for poultry growing farm (315K birds)

Inflow water quality

BOD : 1600mg/L

SS: 500mg/L

Volume 8t/day

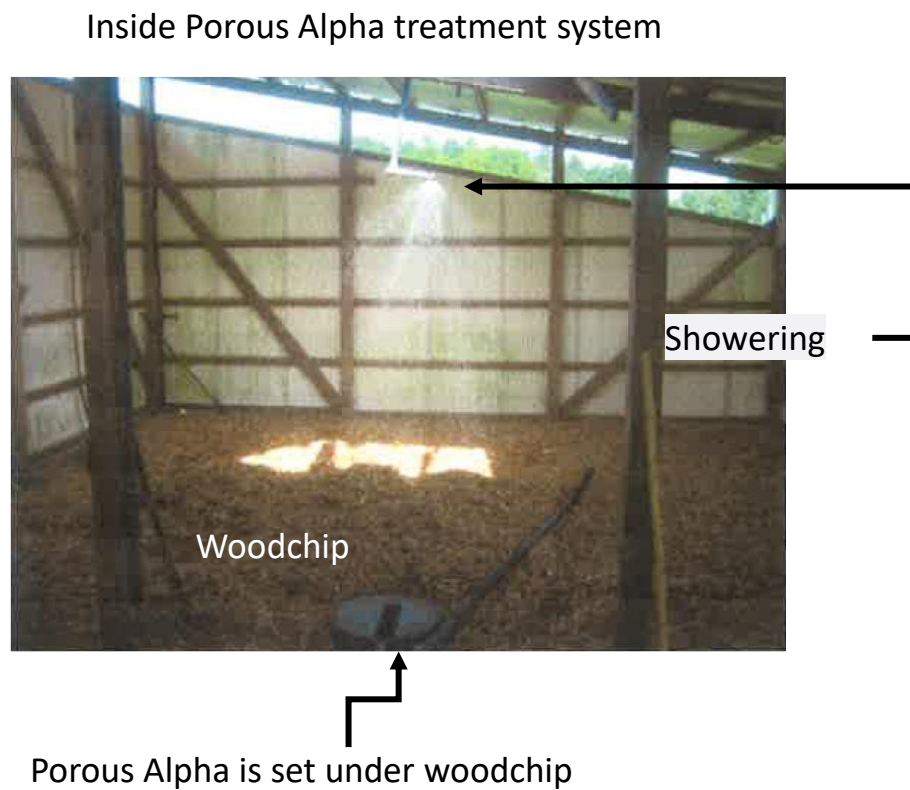
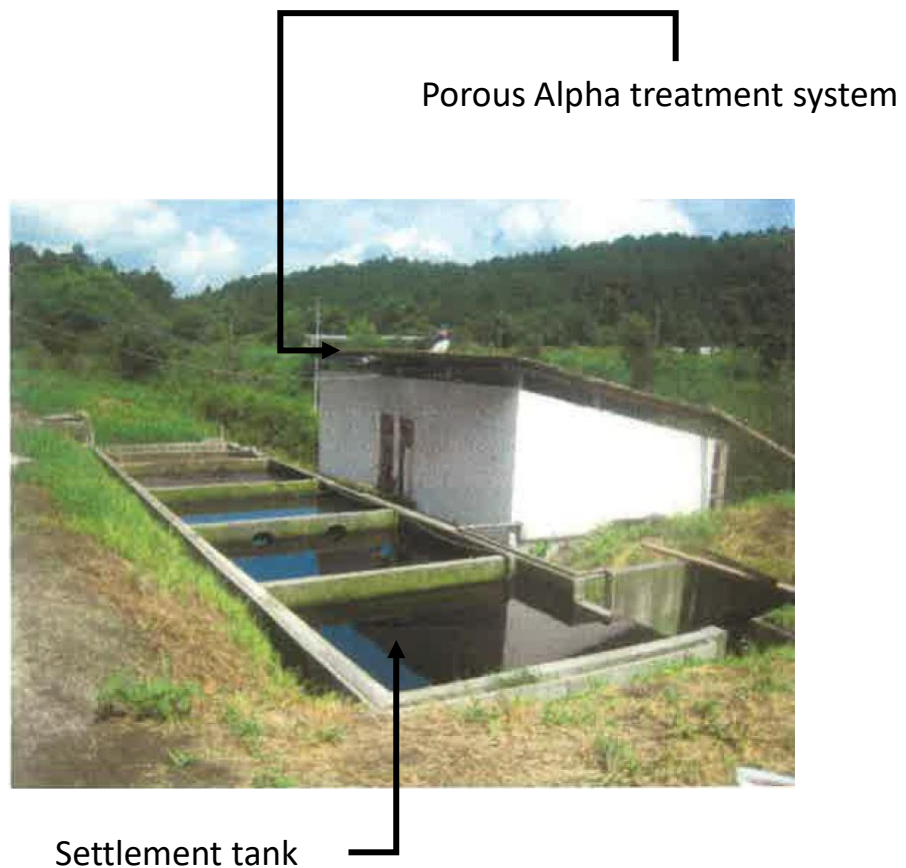


As wood chip is set to remove SS, if SS is removed with the other filter, the treatment can work only with **Porous Alpha**

Way of installation of Porous Alpha: Porous Alpha is filled up on the stage set in the tank

Way of maintenance of Porous Alpha: Back washing

Landscape of the treatment system



Pilot project in Chinese small pond realize the reduction of COD by 85,4% and BOD by 83,0% in one month

Case study: water purification in small pond in China

- Location: Nanming District, Guizhou, China
- Period: Jan. 15, 2012 ≈ Feb. 15, 2012
- Volume of pond water
 - 80 m³ (10m x 10m x 0,8m)
 - 200 m³ in maximum (10m x 10m x 2m)
 - No inflow, no outflow
- Quantity of Porous Alpha: 2,5m³



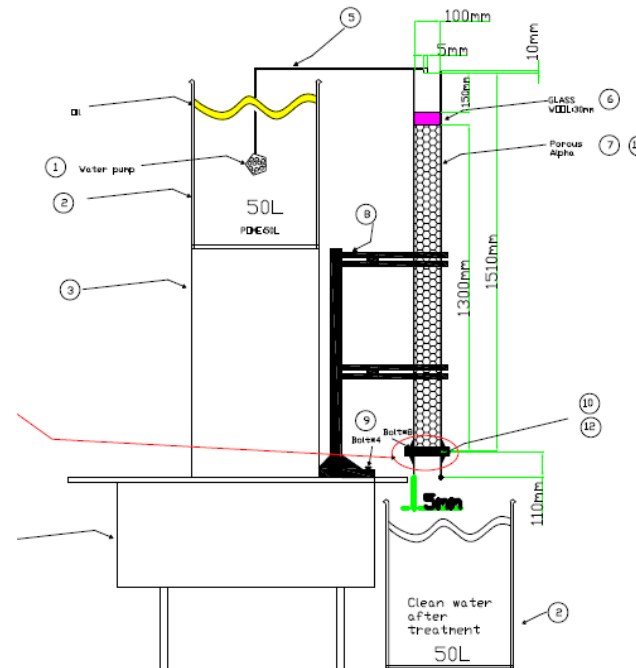
Subject	Before installation	1 month later	Reduction (%)
COD (mg L ⁻¹)	7,35	1,07	85,4
BOD (mg L ⁻¹)	2,53	0,43	83,0

In Malaysia, a small experiment showed significant BOD reduction for palm oil mill effluent

Experiment outline

- Set **Porous Alpha** in a column (10L)
- Drain the POME for a few weeks for microbe activation in Porous Alpha (8L per day)
- BOD reduction started after the activation of microbes
 - Microbes activated in Porous Alpha reduce BOD
- The significant BOD was realized
- It was confirmed that Porous Alpha can reduce BOD not only for high ppm but also low ppm
 - 1.017 ppm → 60 ppm
 - 30 ppm → 11 ppm

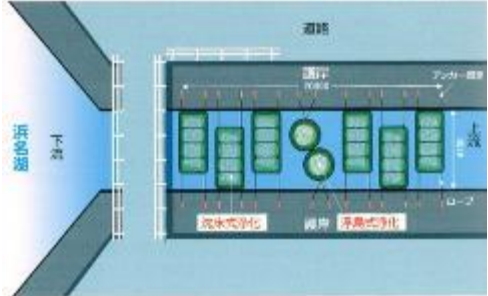

Equipment design



Equipment in MPOB



We have track records for river in Japan, pond and water treatment facility in China

Location	Performance	Project site																		
Volume of Porous Alpha																				
Lake Hamanako, Japan Shinmei River	<table border="1"> <thead> <tr> <th>Article</th> <th>Before installation</th> <th>After installation</th> </tr> </thead> <tbody> <tr> <td>T-P</td> <td>1,1</td> <td>0,78</td> </tr> <tr> <td>T-N</td> <td>3,4</td> <td>3,3</td> </tr> <tr> <td>COD</td> <td>13</td> <td>9,6</td> </tr> <tr> <td>BOD</td> <td>11</td> <td>7,7</td> </tr> <tr> <td>NH₄-N</td> <td>1,5</td> <td>1,02</td> </tr> </tbody> </table>	Article	Before installation	After installation	T-P	1,1	0,78	T-N	3,4	3,3	COD	13	9,6	BOD	11	7,7	NH ₄ -N	1,5	1,02	
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5m ³ (34%)																				

Specification and applicable conditions

- SS and oil should be removed before the treatment by Porous Alpha
 - In the situation that SS or oil cannot be well removed before the treatment by Porous Alpha, Porous Alpha should be washed after the clogging
- It is necessary to secure the contact time between the treated water and Porous Alpha so that the microbes can decompose the elements
- Temperature for active performance of microbe: 10 – 40 °C
- Required volume of Porous Alpha and types of Porous Alpha should be verified through the pilot test
- Our track record to treat the water
 - Wastewater from poultry farm
 - Aquarium
 - Aquaculture farm
 - Small pond
 - River

How can we help?



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