

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





Porous Alpha 'esourceRecvclina

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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*



9,0%

 $K_2O Na_2O Fe_2O_3$

2,2% 2,1% 1,0%

10,4%

MgO

2,1%

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

66,8%



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/c m³
- Size density: $0.9 \approx 1.2 \text{ g/cm}^3$
- Grain size: $50 \approx 2.000 \ \mu\text{m}$ (Median 700 μm)
- 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 1 No-elution of heavy metal	Competitors' products Heavy metal elution is not avoidable	 Merit by the uniqueness Range of acceptable raw material (glass) is wider than competitors' products Widen range of application by safety nature Usable for agriculture as soil conditioner Not contaminating the treated water when used as water treatment agent
² Coexistence of Interconnected and closed pore	Only closed pores	 Possible to contain diversified matter and microbes Diversified microbes for deodorizing Water and air for soil conditioner Air and water are permeable Perform as water treatment agent by sinking in water
3 Adjustable specific gravity and pore size	Constant specific gravity	 Adjustable to the requirement by application and environment



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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	No.	ltem	Result	Criteria
1	Alkyl mercury	Not detected	Not detected	15	1,1 - Dichloroethane	< 0,02mg/l	0,1mg/l
2	Total mercury	< 0,0005 mg/l	0,0005mg/l	16	Cis1,2-	< 0,04 mg/l	0,04mg/l
3	Cadmium	< 0,001 mg/l	0,01mg/g		Dichloroethylene		
4	Lead	0,001 mg/l	0,01mg/l	17	1,1,1 – Trichloroethane	< 0,3 mg/l	1mg/l
5	Organophosphorus	Not detected	Not detected	18	1,1,2 – Trichloroethane	< 0,006 mg/l	0,006mg/
6	Hexavalent chromium	0.014mg/l	0.05mg/l	19	1,3 –Dichloropropene	< 0,002 mg/l	0,002mg/
7	Arconio	< 0.001mg/l	0,03mg/l	20	Thiuram	< 0,006 mg/l	0,006mg/
1	Alsellic Tatal avanages	< 0,00 mig/i	0,0 mg/i	21	Simazine	< 0,003 mg/l	0,003mg/
8	Total cyanogen	Not detected	Not detected	22	Thiobencarb	< 0.02 mg/l	0.02mg/l
9	PCB	Not detected	Not detected	22		< 0,02 mg/i	0,02mg/1
10	Trichloroethylene	< 0,03 mg/l	0,03mg/l	23	Benzene	< 0,01 mg/l	0,01mg/I
11	Tetrachloroethvlene	< 0.01 mg/l	0.01mg/l	24	Selenium	< 0,001 mg/l	0,01mg/l
12	Dichloromethane	< 0.02 mg/l	0.02mg/l	25	Fluorine	< 0,08 mg/l	0,8mg/l
13	Carbon tetrachloride	< 0.002 mg/l	0,02mg/l	26	Boron	< 0,1 mg/l	1mg/l
10		< 0,002mg/1	0,0021119/1	27	Copper	< 0.5 ma/ka	125ma/k
14	1,2 – Dichloroethane	< 0.004 mg/l	0.004mg/l			-,	- J



Core Technology

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





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

Competitors	Plastic media	Wood chip		
Images				
Mechanism and issues	 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 	 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 		
Advantage of Porous Alpha	 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 	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)



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

Porous Alpha treatment system



Settlement tank

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Inside Porous Alpha 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	



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 \rightarrow 60 ppm
 - 30 ppm \rightarrow 11 ppm



Equipment design

Equipment in MPOB







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

Location Volume of Porous Alpha	Performance			Project site
Lake Hamanako, Japan	Article	Before installation	After installation	2016 2017 - 2014-100
Shinnmei River	T-P	1,1	0,78	
	T-N COD	3,4 13	3,3 9,6	
20.8m ³	BOD	11	7,7	
	NH ₄ -N	1,5	1,02	
Chuxiong Yi Autonomous Prefecture, Yunnan, China	Article	Before installation	After installation	
Longijang Park	T-P	0,047	0,018	
	T-N	1,04	0,65	
	COD	46	15	and the second s
	BOD	5,29	1,02	
5m ³ (0,8%)	NH4-N	0,93	0,46	
		_		
Prefecture, Yunnan, China	Article	Before installation	After installation	
Wastewater treatment	T-P	3	0,02	
nlant	T-N	34	9	污水提升泵站 旋流沉砂系统 生物处理系统
plain	COD	20	50	
	NH ₄ -N	30	6,9	
5m ³ (34%)	SS	30	0,02	
				派小刀 南 他 派水分 篱 池 污 泥 脱 水 系 统





- 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



Water treatment: Biofiltration

How can we help?



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