

THE APPLICATION OF ADVANCED ARTIFICIAL SEA SALT AND ITS MARKET PROSPECT

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Abstract: This is a paper that introduces advanced artificial sea salt. It introduces what's the advanced artificial sea salt and the difference between advanced artificial sea salt and normal artificial sea salt, illustrates the present situation in China and the application in ocean world and other aspects. Lately, it forecasts its market prospect.

THE DIFFERENCE BETWEEN ADVANCED ARTIFICIAL SEA SALT AND COMMON SEA SALT.

The sea salt is called man made sea water, artificial sea salt, sea water salt and so on. In recent years, it is known more and more deeply by people and widespread used in sea hall, scientific research institution, restaurant and seafood market. The sea salt is divided into the advanced sea salt and common sea salt. The advanced sea salt is a kind of mixture of the natural sea water substitute by dissolving majority of chemical composition in sea water to certain proportion of fresh water. The advanced artificial sea salt may restore to original state of sea water. After the dissolution, all kinds of element content are approximate to the natural sea water, including more than 40 kinds of elements in the sea water, such as major element and trace element. The advanced artificial sea salt is widely uses in ocean soft class, fish, leviathan as well as the cultivation of rare seafood. The major sea salt in our market is common sea salt. Its raw material mainly is extracted from sea water, then after the physical mixing, common sea salt is obtained. The major element of common artificial sea water is

similar to the natural sea water's. It is mainly used in the seafood breeding and may extent the life time of seafood for more than one week.

The difference between advanced artificial sea salt and common sea salt can be summarized into following several points:

(1) The use of raw material rank is different. The advanced sea salts mainly use medicinal level and edible level as raw material. But the common sea salts just use industrial level as raw material.

(2) The element category of advanced sea salt is more than 40 kinds, but the element category of common sea salt is only around 15~20 kinds.

(3) Some of the advanced sea salt's raw materials need reworking before using, but common sea salt do not need reworking.

The following is the formulation of oversea's advanced and common sea salt.

Table 1. Backhaus artificial sea water formulation

	Composition	Content (g)	Illustration
I	NaCl	27556	Mixing these substance with agitation
	MgCl ₂ · 6H ₂ O	5389	
	MgSO ₄ · 7H ₂ O	6922	
	KCl	733	
	NaHCO ₃	209	
	SrCl	19	
	MnSO ₄	4	
	NaH ₂ PO ₄ · 7H ₂ O	3	
	LiCl	1	
	Na ₂ MoO ₄ · 2H ₂ O	1	
II	CaCl ₂	1379	Dissolve in mild water I
III	C ₁₂ H ₂₂ O ₁₄ Ca®	6.25	Add 80 ml in I
	KI	0.9	
	KBr	270	
	CuSO ₄ · 5 H ₂ O	4.3	
	H ₂ O	2000 ml	
IV	Al ₂ (SO ₄) ₃	4.5	Add 80 ml in I
	CoSO ₄	0.5	
	RbCl	1.5	
	ZnSO ₄ · 7H ₂ O	0.96	
	H ₂ O	2000 ml	

Note: After adjust to request relative concentration, add air to make it saturated and the pH value should be kept between 7.9 to 8.3. ® molecular formula of calcium gluconate

Some overseas' aquariums often use the Backhaus artificial sea water formulation to breed artificial sea organism. After the experimental, this kind of artificial sea water is

already succeed in breeding many fishes. (But regarding to jellyfish, coral and similar invertebrates, there is no experimental related to their breeding.)

Table 2. Subow formulation (g) (1941)

Saline	Content	Saline	Content
NaCl	26.518	CaCl ₂	0.725
MgCl	2.447	NaHCO ₃	0.202
MgSO ₄	3.305	NaBr	0.083

Subow formulation is proved by experimental that it can breed the seafood for around one week.

THE CURRENT SITUATION OF ADVANCED SEA SALT IN DOMESTIC

Presently, the enterprise distribution of the production of advanced sea salt in our country is located in Tianjin, Qingdao, Guangzhou and Shanghai.

ai. The productivity of advanced sea salt in domestic basically can satisfy the request of

domestic aquarium-cultivation. There is a big progress in the cultivation of coral and jellyfish, even some mollusk may multiply in the artificial sea water environment. The product from domestic manufactory basically can substitute the overseas product. But in China the fresh water resource does not distribute proportional, as a result, regional difference of the fresh water resource is existing. The formulation and process of sea salt should be taken actions that suit local

circumstances and made some adjustment, in order to guarantee the ion content in artificial sea water is consistent with the natural sea water. This brings new projects to scientific research institutions and universities which are related to the research of sea salt.

After endeavor for several years, there are more than 40 kinds of trace elements of advanced sea salt developed by the researchers from salt research institute of China national Salt Corporation. The pH value maintains between 8.0~8.4, moreover the KH value is stable. This product is mixed by NaCl, MgCl₂, KCl, MgSO₄, Na₂SO₄ and CaCl₂ at pharmaceutical level and NaHCO₃ at edible level as the main elements, moreover, with some concentrated solution of trace element. Among them, the pharmaceutical level MgCl₂ and MgSO₄ can be used only after the removing of partial crystal water.

From table 3, it is shown that the ingredient of sea salt is very similar as the ingredient of natural sea water. In addition, the concentrated solution of trace element in the sea salt also includes trace amount elements, such as S, P, Si, Al, C, N, Vitamin A, B, C and so on.

The following figure is a change curve table of Ca, Mg, PH and KH of tropical marine advanced sea salt based on testing every 2 days. The total time is 20 days.

The above figures shows that, the Ca & Mg content, KH and PH values are relatively stable and change not obviously in continual 10 times, the interval of each time is 1 day-long. Through the visual observation, the artificial sea water does not have the obvious precipitation.

THE APPLICATION OF ADVANCED SEA SALT

At present the advanced sea salt is widely used in the regional aquarium, but due to the broad land area in China and the difference in regional fresh water, some adjustments need to be done on the formulation of the sea salt in order to ensure the ion content in artificial sea water is consistent with natural sea water.

Except applied in aquarium, the advanced sea salt is also applied in the cultivation of aquarium fish, the ocean science and ocean engineering, the scienti-

fic research institution, the rescue and cultivation of the marine animal who is in imminent danger, as well as the aspects of health and medical community.

There are more than 1,300,000,000 populations and more than 300,000,000 families in China. Along with the enhancement of living standards, people do not only need to enjoy the beautiful scenery of nature

Table 3 The contrast table of artificial sea water from tropics marine and natural sea water from Hainan Island

Quality target	Unit	TROPICAL MARINE Artificial sea water	HAINAN Island Natural sea water
Calcium ion Ca	g/L	0.38	0.36
Magnesium ion Mg	g/L	1.16	1.20
Potassium ion K	g/L	0.36	0.42 (on the higher side)
Sodium ion Na	g/L	9.92	9.81
Chloride ion Cl	g/L	18.01	17.89
Sulfate radical SO ₄	g/L	2.25	2.38
Carbonic acid radical CO ₃	g/L	0.025	None
Sour hydrogen radical HCO ₃	g/L	0.073	0.15
Bromine (calculate by Br)	mg/L	3.7×10^{-3}	0.07
Copper (calculate by Cu)	mg/L	1.4×10^{-3}	1×10^{-3}
Plumbum (calculate by Pb)	mg/L	3.7×10^{-4}	8×10^{-4}
Zinc (calculate by Zn)	mg/L	0.04	0.04
Cadmium (calculate by Cd)	mg/L	3.7×10^{-5}	1×10^{-4}
Chromium (calculate by Cr)	mg/L	1.42×10^{-3}	5×10^{-4}
Manganese (calculate by Mn)	mg/L	0.014	3×10^{-3}
Iron (calculate by Fe)	mg/L	0.12	0.2
Cobalt (calculate by Co)	mg/L	1.4×10^{-4}	1×10^{-3}
Nickel (calculate by Ni)	mg/L	7.3×10^{-4}	1×10^{-3}
Arsenic (calculate by As)	mg/L	2.5×10^{-3}	2×10^{-3}
Hydrargyrum (calculate by Hg)	mg/L	none	4×10^{-5}
Selenium (calculate by Se)	mg/L	2.5×10^{-4}	$< 1 \times 10^{-4}$
Barium (calculate by Ba)	mg/L	0.09	0.1
Fluorin (calculate by F)	mg/L	0.028	1.1
Iodin (calculate by I)	mg/L	0.06	0.08
Boron (calculate by B)	mg/L	1.58	None
Salt content (%)		3.206	3.206
Remark		Dissolve the artificial sea water from tropics sea by distilled water	Sampled at 07-01-2006

Note: Artificial sea water from Tropical Marine and natural sea water from Hainan Island is tested by National Center for Quality Supervision & Inspection of sea salt and lake salt.

mountain and river, but also need to watch all sorts of strange and unusual marine animals and plants at home. Nowadays, there are a few families have already had some fishes to see and enjoy in China. This is a significant sign which represent as the humanity achieves the living standard of civilized time, it will have a big development from now on. In the research of marine science and ocean engineering, some simulation tests by using artificial sea water are often needed to be carried indoor, to determines the physics and chemistry parameters which is difficult to measure in some bad conditions of marine, the parameters including wave, meteorological, optics, harmony and so on. In addition the simulation test of sea water

electrochemistry corrosion may also be used. There are no organic pollutant and exceeding heavy metal in the artificial sea water, so the artificial sea water will not effects on the marine life. Base on that, it provides big convenient for the scientific academe to breed marine life and microorganism; to study its living characteristic and life history. Because the humanity can take use of advanced artificial sea salt to make artificial sea water which is very close to the nature sea water, therefore it plays an important role to save the marine life which is close to extinction. The main salt and trace element in artificial sea water is good to skin disease

and the micro cycle of human body.

MARKET ANALYSIS ON ADVANCED SEA SALT

The advanced sea salt has a big market potential because of the aboard purpose. In recent years, along with the rapid development of sightseeing tourist industry and the improvement of living standard, many aquariums are built all over the country to breed the precious sea water fish to watch for the people. Now, many aquariums are using advanced sea salt to breed sea water fish. Because the sea water which obtains from the offing shore sea has degrees of pollution; the concentration of nitrate and phosphate increases gradually; the quality is unstable; mischief to aquatic organism is caused by untreated sea water; the transportation of sea water to interior area where is far away from seacoast is inconvenient is uneconomical. There are around 25 aquariums is using artificial sea salt in the amount of 35 aquarium all over the country at present. Moreover, the new aquariums built in Tianjin, Chengdu, Hangzhou, Wuhan will also use artificial sea salt to carry on the cultivation. The annual used amount of sea salt in aquariums is above 3000 tons at present. In addition, the aquatic animal market is vigorously growing in the whole country. Take the Tianjin area as an example, there are about 2000 companies or families is cultivating fishes for watching, about 15 tons of sea salt is used per year. The conservative estimation of sea salt used amount in commercial market in China is 500 tons. In addition aquariums in all over the world also needs massive artificial sea salt. Because labor force and material cost in our country are still

relatively lower presently, consequently if the product quality achieves the standards, our products will have very strong competitive power. The advanced sea salt produced in (salt research institute of China national salt corporation not only has satisfied the demanding of domestic aquariums and civil market, but also has sold to places such as US, Japan, Taiwan, Hong Kong and so on. It receives the general acceptance.

In China the resources of salt industry is enrichment. The successful development and market application of advanced sea salt not only provide good production to domestic research institute and aquarium but also changed the situation in China that the advanced sea salt is mainly depends on importation. Simultaneously it also enhanced the added value of salty production and supports new direction for the industrial development.

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