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THE NEW TECHNOLOGY AND PRACTICAL APPLICATION  
OF SPECIAL ELECTROLYZED DEOXIDIZED AND IONIZED WATER  
WITH NEGATIVE ION

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*Abstract: Hydroxide ions [OH<sup>-</sup>] increase by that electric energy, and Electrolyzed deoxidized and ionized water S-100 that electrolysis is done in the special method as to special quality of electrolysis shows alkalinity, but it is not dangerous alkali because it doesn't have "the pair ion" which radiates a hydroxide ion. Moreover, it was different from the sodium hydroxide [NaOH], and didn't have a chemical burn and skin stimulus, and it confirmed that that had effect with the high effect on exfoliation and the application in every field with the special ion water which had many electrons (minus electricity) by the safety as well.*

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## Preface

Conventionally, the detergent was able to ask for reduction or a disabling of the using of halogen hydrocarbon system solvents accompanied by environmental pollution, such as Freon and trichloroethane, by the Montreal Protocol. Although various detergents have appeared instead of these, since the problem will have arisen in the washing efficiency if all consider environs, the development of a detergent sufficiently friendly to the environs which was excellent in the washing efficiency is hurried. Moreover, the reduction of the amount of the medicine used in a washing process has been a task important among advanced nations now by rise of earth environment protected consciousness in recent years. Moreover, though alkaline electrolytic ion water is generally a very thin medicine concentration, since it has the washing efficiency to have excelled, the reduction of the large amount of the medicine used is expected by application in a wet process. As for the amount of the medicine used in electrolytic water washing, trial calculation of the reduction of the amount of the medicine used at the time of replacing the general washing way by general electrolytic water washing reports the test result of the conventional method of being reduced very much by 2% of 1/50. In the partial geographic of industrialized nations, regulation of Total Dissolved Solid (TDS) is beginning to be applied to drainage, and we can already hear about duty in which natural environment must be kept. While the technology of electrolytic ion water merely maintains not only the increase in efficiency of surface washing but the harmony with natural environment, in order to manufacture an advanced product in the future, we have to expect and do our best in the development for protecting this earth.

In the present, while the technology of an electrolytic device and the chemistry of electrolytic ion water are expected, the development of the cleaning equipment only for electrolytic ion water is also furthered. S-100 developed using the advanced technology is super-electrolytic ion water, which is proud of the performance excellent in the exfoliation effect harmless and moreover stabilized unlike the electrolytic ion water generated by the conventional electrolytic device, and it is reported by the recycling washing system that there is almost no environmental impact. Moreover, not only the washing field but the application to broad fields, such as the cosmetics field and the food field, from the medical fields, such as medical supplies, is expected.

The biggest special feature that water originally has has the property to make almost all substances, such as an organic matter and an inorganic substance, dissolve or ionize. Since S-100 which used this property, considered it as water with many anions (electron) obtained by the electrolytic process, maintained the electron by the application by the exfoliation action by that electric energy and its action and underwater, and succeeded in stabilization was made into the subject of research and examined, it reports.

**[The prevents rust effect The preservation-from-decay effect]**

It is usually accompanied by oxidization and reduction, and if an electron is taken and the component of one of the two of the substance, which reacts, oxidizes (obtaining an oxygen atom), the component returned by obtaining an electron on another side (losing an oxygen atom) exists. Moreover, the living being oxidized the complicated organic matter with enzyme, and has obtained the energy. Since S-100 electrolyzed by the special way was the return flow that can maintain the concentration of hydroxide ion for a long time, it could deter oxidization and checked that there were an effect that prevents the rust started by oxidization, and an effect that prevents oxidization of an organic matter.

**[Effect on sterilization and the effect which prevents mold]**

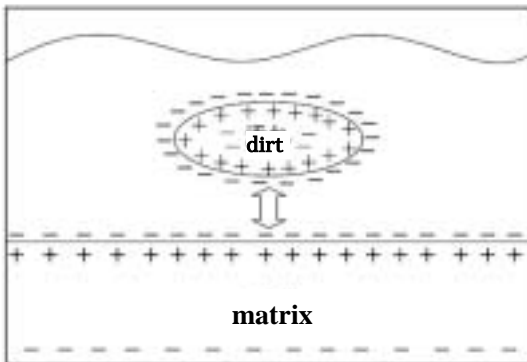
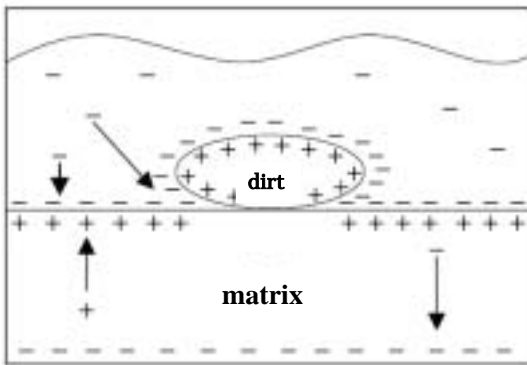
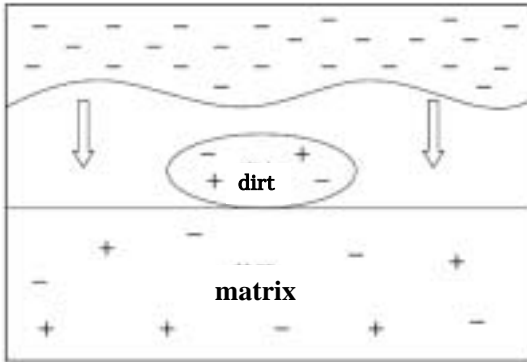
The effect is greatly drawn out by what not only depends S-100 on the exfoliation effect but the electrical energy that this has. Generally, a microbe breeds best in the limited pH coverage, respectively, and a microbe shows a good growth with a neutrality or alkalescence (pH 6.0~8.0). Moreover, although mold and yeast show a growth slightly good at the acidity side (pH 4.0~6.0), even a special alkali-loving microbe is pH 10.5 order. S-100 is very as high as around pH 12.0, and since it separates greatly from the breeding region of a microbe, it is thought that power is demonstrated also to these.

**[The deodorization effect]**

Since there is a reduction efficiency to prevent oxidization of an organic matter, the exfoliation effect, the preservation-from-decay effect, a sterilizing effect, the effect that prevents mold, etc. are considered that there is an effect also in deodorization.

**[The difference from the alkali ion water made with a commercial electrolytic generation machine]**

The alkali ion water made with the commercial electrolytic generation machine for drinks is pH9 or less, and cannot make the ion water of high pH. This is because sodium hydroxide (NaOH) is generated, it is dangerous, so electrolytes other than salt will be used for the alkali side if salt (NaCl) is used for an electrolyte. Although washing came to be performed, using an electrolytic generation machine also in the object for industry and the equipment which generates pH 12.0 order also came out these days, since salt is too used as an electrolyte, the property is equivalent to 0.1N sodium hydroxide, and cannot be drunk. Moreover, since these cleaning methods do not need a cleaning solvent, it excels in environmental protection, but a washing efficiency is low, and since the acid water generated cannot be neutralized, it has many problems, such as a treatment of a drainage, a stability, an incidental cost.



### **【Exfoliation action】**

It confirmed that there was high exfoliation action in Electrolyzed deoxidized and ionized water S-100 by the experiment. Even if the dirt with which the substance was stained adheres also to a concavo-convex field, which is not known unless it sees under a microscope and it wipes it with water or a cleaning solvent by the static electricity or a chemical reaction, it does not come off easily. Furthermore, if it wipes with a common cleaning solvent and a common cleaner, the oil of a cleaning solvent or a cleaning solvent may remain in a concavity, and it carries out the chemical change of the dirt and may not only become difficult to take it, but it may cause a chemical change in a re-adhesion of dirt or matrix. If S-100 touches dirt and matrix for the negative ion water which has so much the electron obtained from the ion exchange membrane or the electrode by electrolytic process, a lot of negative ion which are asking for the positive ion will positive-ion-ize dirt and the top layer of a matrix by electric force and an intermolecular force. Next, the power of the plus which tries to pay well mutually, and minus is added between dirt and a matrix, and a capillarity facilitatory effect is born. The top layer of a matrix is also covered by a negative ion at the same time the top layer of the positive-ion-ized dirt finally draws near and wraps in a negative ion. And the repulsion by the electric force of the population negative ion, which exists in the top layer of dirt and matrix, pulls each other apart, and the exfoliation event facilitatory effect is produced. Thus, dirt will be completely come floating over a detail and can remove only dirt. The emulsification action by the lipophilic group and hydrophilic group that are the basic structure of a surfactant has not occurred. Therefore, we can understand leaving nothing without causing at all a chemical change, which is looked at by a cleaning

solvent, the common cleaner, etc., and hurting top layer of a substance. Moreover, a re-adhesion of dirt also becomes very small by the ionization on the top layer of a matrix. Thus, in order to also remove completely the molecule of the dirt which becomes the stinking one origin, and a microbe, it excels in the deodorization effect, a sterilizing effect, the mold prevention effect, etc., the reduction action of an anion protects oxidization further, and it is thought that the rust prevention effect, the preservation-from-decay effect, and the sterilization effect are also demonstrated.

### **【Various testings】**

From the special feature of the electric energy, which S-100 has, the application in all fields was considered and the next effect testing was done. To the security, the acute toxicity test, the Acute Oral Toxicity testing, and the eye stimulativeness testing were done. Moreover, to the effect, the antistatic effect, odor eliminating, the chemical corrosion resistance test, the vulcanized-rubber immersion testing, and the sterilizing-effect testing were done. Furthermore, OH by ESR measuring -- the radical occurrence status was examined. It described about the washing efficiency test result, which an exfoliation action has in the end, and the likelihood of agricultural use and medicine use.

## [Acute toxicity test result]

### 1. Test method

The exam was done according to the acute toxicity test [JISK-0102-1993 (71)] by fishes.

- 1) Sample: S-100
- 2) Testing fish: Crazies laptops  
Mean-value length 3.0cm  
Mean-value weight 0.24g (n=10)
- 3) Acclimatization: The same water quality (dilution water) as a test condition, the temperature, and the lighting were made to acclimatize a testing fish for front [testing] 14 days.  
In addition, death of the testing fish in an acclimatization period was 5% or less.
- 4) Test method: Stationary type
- 5) The number of testing fish: Ten per 1 testing water
- 6) Testing water temperature: 23±1 degree C
- 7) Lighting: A 14-hour lighting / day
- 8) Testing tank: Round shape glass tank
- 9) Dilution water: Tap water pH7.19 hardness alkalinity of 42mg (as CaCO<sub>3</sub>) of 35mg (as CaCO<sub>3</sub>), which removed residual chlorine by natural neglect
- 10) A regulation of testing water: The sample was added in dilution water, the testing water of each concentration was adjusted, and it was considered as the testing division.
- 11) Measuring: The behavior of the testing fish in each testing division was observed, and the number of deaths 96 hours after 24, 48, and 72 was recorded.  
Moreover, pH and the relative voltage potential of each division testing water at the time of a test starting and a quit were measured by the glass electrode method, and dissolved oxygen was measured by the diaphragm electrode method.
- 12) The calculation way of LC50 value: The Van der wear den method

### <Test result>

Table-1 mortality rate (%)

Testing concentration (mg/L)	Mortality rate (%)			
	24h	48h	72h	96h
100,000	0	0	0	0
50,000	0	0	0	0
25,000	0	0	0	0
10,000	0	0	0	0
5,000	0	0	0	0
1,000	0	0	0	0
Contrast division	0	0	0	0

Table-2pH, relative voltage potential, and dissolved oxygen

Testing concentration (mg/L)	Mortality rate (%)		
	pH	mV	DO
100,000	9.77	-225	6.35
50,000	9.32	-200	6.35
25,000	8.85	-173	6.37
10,000	8.43	-148	6.37
5,000	8.21	-136	6.38
1,000	8.04	-125	6.38
Contrast division	7.19	-118	6.38

### 2. Consideration

The mortality rate in all the testing concentration regions was 0%. Therefore, the 0% mortality rate in a testing was 100,000mg/l, and the amount of samples was 8,341mg (436,681 ppm/g)/g per weight.

## [Acute Oral Toxicity test result]

### 1. The testing purpose and a test method

About the sample S-100 (undiluted solution), the Acute Oral Toxicity testing (limit testing) in a mouse was done based on the OECD chemical substance toxicity pointer (1987).

After checking that perform preliminary breeding for about one week, and it is healthily normal in the ICR system sex mouse of four-week age, it bred at the breeding room set as the room temperature of 23±2 degrees C, and lighting 12 hours/day, and a sample and drinking water (tap water) were made to take in freely.

The testing group and the contrast group made the test animal fast before medication for about 4 hours using each ten sexes. And after measuring weight, by the testing group, by 20 mL(s)/kg dosage, the sex used the stomach sonde for the sample and carried out forced single time oral administration.

Carrying out the observation period 14 days, the medication day performed one observation per day from the next day several times

Weight was measured after medication weekly, t-verification performed the compare between groups by 5% of the significance level, and all animals were dissected at the time of the quit of exam time.

### 2. Test result

#### 1) The example of death, and mortality rate

As for the example of death, a sex was not accepted during the observation period.

#### 2) General status

As for bads, a sex was not accepted during the observation period.

### 3) Weight variation

As for the difference, by the weight measuring for one week and two weeks, a sex was not seen between the testing group and the contrast group after medication by the incrementing in weight.

Medication group		Before medication	After medication	
			7 days	14 days
Male	Testing group	27.2 ± 0.7(10)	33.2 ± 1.4(10)	37.6 ± 1.3(10)
	Contrast group	27.0 ± 0.7(10)	33.6 ± 2.1(10)	38.4 ± 2.6(10)
Female	Testing group	22.1 ± 0.8(10)	25.2 ± 1.8(10)	28.1 ± 1.9(10)
	Contrast group	22.0 ± 0.8(10)	24.6 ± 1.1(10)	27.5 ± 1.7(10)

Weight was expressed with the average ± standard deviation (unit of measure: g). The inside of a parenthesis is the number of animals.

### 4) Dissection view

As for bads, in the dissection after the quit of observation, a sex was not accepted in main internal organs.

### 3 . Consideration

With this pointer, when a sample was solution, it was pointing that the given dose should not exceed 2mL (20 mL/kg) in the weight of 100g, and the example of death was not accepted in this highest quantity that can be prescribed for the patient, and bads were not accepted at an exam at the time of dissection, either.

## [Eye stimulativeness test result]

### 1 . The testing purpose and a test method

About the sample S-100 (undiluted solution), the eye stimulativeness in a rabbit was investigated based on the OECD chemical substance toxicity test pointer (1987).

After the rabbit checked that preliminary breeding for one week or more was performed, and bads will be in a general status about a Japanese white buck hare, it used three animals for the testing and bred them at the breeding room which accommodated in the cage made from error recovery program individually, and was set as the room temperature of 22±2 degrees C, and lighting 12 hours/day. Feed carried out qualification medication (120g/(day)) of the solid type feed for rabbits [CR-3 and made in Japanese Clare], and after checking that it inspected the anterior ocular segment of the both eyes of each test animal at test starting that day, and was normal after drinking water carries out free ingestion of the tap water, it examined. Eyewash was applied in sample 0.1mL in the one eye conjunctiva reverse side of each test animal after the weight measuring, and the for [about 1 second] top lower eyelid was united quietly, and was held, and other eyes

were considered as contrast non-taken a measure. When a slit ramp (x10) [made in Kowa] is used in 1 hour, 24 hours, 48 hours, and 72 hours after applying eyewash and a diaphragm stimulus retroaction is accepted in 72 hours after applying eyewash, observation is continued until a retroaction disappears within the limit of 504 hours (21 days). Based on the norm, it evaluated about the eye stimulativeness of the sample using the acquired grading value from the peak value of the mean-value total marks in each testing time.

### 2 . Validation classification of eye stimulativeness

Mean-value total validation	Classification	Mean-value total marks	Classification
0 ~ 5.0	Non-stimulus	30.1 ~ 60.0	Degree stimulus of middle class
5.1 ~ 15.0	Slight stimulus	60.1 ~ 80.0	Inside - a strength stimulus
15.1 ~ 30.0	Stimulus	80.1 ~ 110.0	Strength stimulus

### 3 . Result -- [temporal transition of total marks, and a validation of eye stimulativeness]

(Inside of a parenthesis = candidate eye)

Test animal	The point in each observation time evaluating [ total ] (h=hour)			
	1h	24h	48h	72h
	2(0)	0(0)	0(0)	0(0)
	2(0)	0(0)	0(0)	0(0)
	2(0)	0(0)	0(0)	0(0)
Mean-value total marks	2(0)	0(0)	0(0)	0(0)
A validation of eye stimulativeness	A non-stimulus			

From the upper result, the sample was estimated to exist under the category of "a non-stimulus" in a rabbit.

## [Other effect test results]

### 1 . The corrosion preventing effect

Since contacting various metals is also considered when using electrolytic-process alkali ion water as a detergent, In order to grasp the corrosion event in a real environs, based on the test method of JISKO100 (industrial water corrosiveness test method) and JISK2234 (antifreeze solution), the laboratory test was done as compared with pure water.

#### (1) Corrosion velocity (mdd=mg/dm<sup>2</sup>/day)

Steel type	S - 100	Pure water	Desired value
Cast iron (FC200)	1.215	4.850	5.0 or less
Cold-rolled steel (SPDD-B)	0.288	0.578	1.0 or less
SUS 405	0.001	0.013	0.1 or less
Aluminum (AC2 A-F)	0.087	0.192	0.1 or less
Copper (C1100P)	0.015	0.189	0.1 or less

Test condition: Temperature: 20±5 degrees C  
 Test time: For 14 days  
 Test piece: 50 × 30 × 1mm  
 Test condition: rest immersion

electricity antistatic fatigue dress) in order to obtain the high test result of a reproductivity, since a static-electricity event is deficient in a reproductivity.

Sample regulation: The method of washing specified to JISLO217

According to a numbering 103, provisioning water 20 ml/m<sup>2</sup> is sprayed on the sample (polyesters 100%) which performed (Wash.. rinse.. drying .. natural seasoning), and it is a 1-hour hot wind (70 degrees C) desiccation. Humidity is adjusted after that for 24 hours (the temperature of 20±5 degrees C, 40% or less of relative humidity), and it encloses with a polyethylene bag.

(2) Remark

Corrosion is an event invaded chemically or electrochemically by the environmental substance with which a metal encloses it, and rust is a compound that makes an entity hydroxide or the oxide generated on an iron top layer in usual. Although the basic substances of corrosion are water and dissolved oxygen, the carbon dioxide on the relationship that is using the fundamental as pure water, and in the atmosphere melts, and offered water produces H<sup>+</sup> and H<sub>2</sub>CO<sub>3</sub><sup>-</sup>, and these are added to a cathode retroaction and it produces H<sub>2</sub>. Considering the influence of pH, generally, or less by pH4, the waterworks matter occurrence type corrosion that a corrosion product dissolves is produced, and a corrosion velocity becomes large. Moreover, fundamentally, or more by pH 10, passivation arises and corrosion becomes small. Since corrosion factors, such as a temperature, the flow velocity, and melting salts, were not added to the testing, the occurrence of the environmental embrittlement was not seen in spite of the high pH castle. However, in the top layer of the test piece of pure water, the local corrosion that does not appear in a corrosion velocity was checked. This is considered that an oxidized type passive state puncture is one of the causes.

- Test method: 1) Pay a sample to 1 revolving frictional means, and operate on a 60±10-degree C magnetic drum storage for 15 minutes.  
 2) Take out a sample from a magnetic drum storage with the glove made from an insulation, and look for amount of electrification electric charges Q (C).  
 3) Discharge the static electricity charged in the sample with a self-discharge means for every time.

2. Antistatic effect

It experimented based on the knowledge that it is expectable even if effects which control the adhesion dirt of the quality of dirty things especially, such as a fire trouble which originates in a static-electricity electrification and is generated, are transient.

(1) Vinyl chloride board

After [ which rubs to a vinyl chloride board (300 × 300<sup>1</sup> mm) with cotton, and has a resistor of 1018 Ω·cm in it ] carrying out the thing validation, 5ml of offered water were sprayed on each test piece. After wiping off lightly and drying with alkaline paper, the same frictional as a check test was performed with cotton, and the potential was measured with the electrometer as compared with pure water.

<Test result>

	S - 100	Pure water
The amount of electrification electric charges ( μC )	0.8	1.5

3) Remark

Although the insulation-resistance value has added various sprays for preventing static electricity at the synthetic resin which is easy to be tinged with a static electricity highly according to the request level to the occurrence prevention of a fire trouble, it is thought by carrying out atomizing of “S-100” at a fixed spacing that the desired end reaches.

<Instrumentation result>

	S - 100	Pure water
Surface specific resistance ( Ω )	10 <sup>12</sup>	10 <sup>18</sup>

Purpose	Surface specific resistance ( Ω ) request level
The trouble preventing in a static status (dust adhesion preventing)	10 <sup>12</sup> ~ 10 <sup>13</sup>
The trouble preventing in a dynamic status (regular antistatic)	10 <sup>10</sup> ~ 10 <sup>12</sup>

(2) Polyester fiber

It was performed according to JIST8118 (static

### 3. Odor eliminating

#### (1) Trimethylamine

Measuring method: 0.5g of each sample was taken to a 50ml Erlenmeyer flask, 30 μ l of trimethylamine 30% solution I was added, and the head space gas of the container was measured with the gass chromatography after the sealing mix.

Measurement condition: Column Diglycerol(15%) + TEP (5%) + KOH (2%) 3 mm × 3mm, column temperature of 70 degrees C.

<Measurement result>

Elimination factor ..... 81.3%

#### (2) Methyl mercaptan

Measuring method: 1) Carry out room-temperature neglect, pouring into the container which measured 1g of one sample in the container, carried out the airtight stopper to it, and carried out the airtight stopper of the methyl mercaptan 50 μ l using gastight syringe and shaking.

2) According to lapsed time, the gas in a container was poured in to gas chromatogram.

3) The blank test was done similarly and the pitch of the peak on the obtained gas chromatogram was measured, and the blank was set to 100 and it searched for the residual ratio in each measuring time of a sample.

<Measurement result>

Bad smell substance residual ratio (unit of measure: %)

1min	3 min	5 min	10 min	20 min
30	10	8	5	3

#### (3) Hydrogen oxide

Measuring method: The liquid "S-100" was put into the desiccator, hydrogen sulfide was enclosed so that it might be set to about 100 ppm, and the gas concentration in a desiccator was measured temporally.

<Measurement result>

Sample	Lapsed time (minute)					
	2	10	20	30	40	60
S-100	30	17	5	2	<1	<1
Control	102	102	102	100	98	95
Blank test	102	102	102	100	96	95

control is purification water (unit of measure: ppm), and initial gas concentration is about 100 ppm and <1= un-detecting.

#### (4) Remark

The serious high bad smell remove considered to be append / polymerization retroaction and counteraction was accepted.

### [Chemical corrosion resistance test result]

1. Each sample was examined in liquor ratio: 200mL / three pieces for test-temperature: 23±2 degree C, and test time: seven days based on chemical corrosion resistance test way JISK7114 of a plastics about the sample "S-100" (undiluted solution).

#### 1. Result

Sample	Test result	
	Mass change (%)	Special affairs (after-testing appearance variation)
PET	+0.25	variation is not accepted
FRP	+0.36	variation is not accepted
POM	+0.38	variation is not accepted
PVC	+0.07	Variation is not accepted
PC	+0.14	variation is not accepted
ABS	+0.52	variation is not accepted
PP	+0.03	variation is not accepted
PE	+0.03	variation is not accepted
Acrylic resin	+1.09	variation is not accepted
Plastics	+0.02	variation is not accepted
Denaturation polyethylene terephthalate	+0.32	variation is not accepted
Silicone rubber	+0.30	variation is not accepted
Urethane rubber	+1.04	variation is not accepted



## [Vulcanized-rubber immersion test result]

- Sample A: cleaning fluid only for rubber (C company product conventional article)  
Sample B: S-100
- Sample name: Rubber roller (D company products)  
Sheet roller (D company products)
- Testing purpose  
The cleaning fluid only for rubber of the sample A currently used from the former had had big influence on the product which uses the rubber by the chemical change after washing. When it washed by "S-100" that is a sample, it examined how much difference there are.
- Test method  
(1) Japanese Industrial Standard K 6253 "hardness test method of vulcanized-rubber and thermoplastic rubber"  
(2) Japanese Industrial Standard K6258 "the immersion test method of a vulcanized rubber"

### 5. Testing subject and result

1, immersion liquid: The sample A ( $23 \pm 1$ -degree-Cx 72 hours) room temperature of 23 degrees C

Sample name		Rubber roller	Sheet roller
Test method			
(1) Hardness testing	Durometer	29	25
(2) Immersion testing	Hardness variation	-1	+ 2
	Volume change	+ 7	-28

2, immersion liquid: The sample B ( $23 \pm 1$ -degree-Cx 72 hours) room temperature of 23 degrees C

Sample name		Rubber roller	Sheet roller
Test method			
(1) Hardness testing	Durometer	29	25
(2) Immersion testing	Hardness variation	$\pm 0$	-1
	Volume change	$\pm 0$	$\pm 0$

### 6. Consideration

From a test result, the chemical variation was not accepted at all to the sample "S-100" of Sample B. Moreover, in an immersion testing of Sample B, although the hardness variation showed -1, since the volume change is  $\pm 0$ , the sheet roller of the sample that had already oxidized is considered that the reduction action restored.

## [Sterilizing-effect test result 1]

- Test method  
The liquid "S-100" was used as test liquid, liquid 0.5mL by which various bacilli went into test liquid and control (sterile purified water) 49.5mL was added, and it mixed, and it converted into the number of micro organisms per the 1mL 3, 6, and 24 hours afterward, saving these at 25 degrees C. In bacillus subtilis, the mycelia cake of the test organism cultivated for 35 degrees C and 14 days by NA culture medium is made to suspend to sterile purified water, it heated for 20 minutes and 65 degrees C of nursing cells were annihilated. After carrying out centrifugal separation of this soil suspension and removing supernatant liquid, sterile purified water was made to suspend again the mycelia cake obtained from there, and it adjusted so that the number of bacilli (the number of bacterial spores) might serve as about 108/mL, and was considered as bacterial spore liquid. Moreover, in test organisms other than bacillus subtilis, culture solution of the test organism cultivated for 35 degrees C and 16 to 20 days by NA culture medium was made into the mycelia cake.

### 2. Bacillus measurement result of test organism added to test liquid

Test bacilli	Sample	The number of bacilli			
		Starting	3 hours after	6 hours after	24 hours after
Escherichia coli	S-100	$3.3 \times 10^6$	<10	<10	<10
	control	$3.3 \times 10^6$	$4.8 \times 10^7$	$1.8 \times 10^7$	$3.3 \times 10^7$
Pseudomonas aeruginosa	S-100	$5.2 \times 10^6$	<10	<10	<10
	control	$5.2 \times 10^6$	$3.4 \times 10^6$	$2.1 \times 10^7$	$6.5 \times 10^7$
Salmonella	S-100	$4.5 \times 10^6$	<10	<10	<10
	control	$4.5 \times 10^6$	$2.4 \times 10^6$	$7.2 \times 10^6$	$1.5 \times 10^7$
Staphylococcus aureus	S-100	$4.9 \times 10^6$	$1.1 \times 10^4$	10	60
	control	$4.9 \times 10^6$	$5.3 \times 10^6$	$8.8 \times 10^6$	$1.0 \times 10^7$
MRSA	S-100	$2.5 \times 10^6$	$6.5 \times 10^2$	10	10
	control	$2.5 \times 10^6$	$2.8 \times 10^6$	$4.8 \times 10^6$	$9.8 \times 10^6$
Vibrio parahaemolyticus	S-100	$4.4 \times 10^6$	<10	<10	<10
	control	$4.4 \times 10^6$	$5.5 \times 10^6$	$1.1 \times 10^7$	$3.1 \times 10^7$
Bacillus subtilis	S-100	$5.7 \times 10^6$	$2.8 \times 10^6$	$2.9 \times 10^6$	$1.9 \times 10^6$
	control	$5.7 \times 10^6$	$2.9 \times 10^6$	$3.5 \times 10^6$	$4.9 \times 10^6$

Salt was added 3%. <10: Don't detect

## [Sterilizing-effect test result 2]

- Purpose and test method  
The antibacterial activity testing (sterilizing effect over the bacillus adhering to the plate made from a plastics and the plate made from a china) in a sample "S-100" was done using the "Public Health Research Institute segregation stock" which is a sample strain (Escherichia coil O-157:H7).

- (1) A regulation of test organism liquid : what diluted suitably the ordinary bouillon culture solution of a sample strain, and was diluted with the last dilution stage using the ordinary bouillon culture medium was used as test organism liquid.
- (2) A regulation of the sample for a measuring : the path of the plane fractions offered by the client carried out 1mL application of the liquid of the bacillus adjusted to the plate which is about 14cm by (1), and made what was dried by the wind for 30 minutes the sample for a measuring.
- (3) Measuring method: The sample plate adjusted by (2) was calmly filled with sample liquid 100mL, and after placing calmly and processing for 10 minutes, the number of residual bacilli of the sample bacillus was measured by the regular way about the wiping liquid of the sample plate top layer from which sample liquid and sample liquid were removed. In addition, it measured similarly, using sterilization phosphoric-acid buffer solution as contrast liquid.

99.99% in a plastics plate, a china plate, liquid, and a plate top layer compared with the number of bacilli before a treatment offered as a sample. Although not rinsed in this experiment, perform after-treatment rinse in an actual using.

### **[Sterilizing-effect test result 3]**

Testing: The antibacterial activity testing by “S-100”

Sample: S-100 undiluted solution

Contrast: Sterile purified water

Temperature: Storage temperature of 26.5 degrees C

Starting: The useful number of bacilli immediately after the liquid addition by which the bacillus went into a sample and control was measured, and it was considered as the starting.

Test organism: Herpes simplex virus (HSV) type 2, trachoma chlamydia, Neisseria gonorrhoeae (CTA culture medium), a Propionibacterium acnes bacillus (pimple bacillus)

#### 2. Test result

Test bacilli	Feed	Before a treatment 1 (the number of bacilli)	Classification (treatment liquid)		2After a 10-minute treatment (the number of residual bacilli)
			S-100	Liquid	
Escherichia coil O-157	Plastics plate	1.1 × 10 <sup>6</sup> Per sheet	S-100	Liquid	<1.0 × 10 <sup>2</sup> /mL
				Plate top layer	<1.0 × 10 <sup>2</sup> /plate
			control	Liquid	<2.2 × 10 <sup>4</sup> /mL
				Plate top layer	<1.7 × 10 <sup>5</sup> /plate
	China plate	1.0 × 10 <sup>6</sup> Per sheet	S-100	Liquid	<1.0 × 10 <sup>2</sup> /mL
				Plate top layer	<1.0 × 10 <sup>2</sup> / plate
			control	Liquid	<1.0 × 10 <sup>4</sup> /mL
				Plate top layer	<4.6 × 10 <sup>5</sup> / plate

Testing bacilli	Test liquid	Starting	60 seconds after	2 hours after	4 hours after	6 hours after
Herpes simplex virus type 2	S-100	1.5 × 10 <sup>5</sup>	<100	<10	<10	<10
	control	1.5 × 10 <sup>5</sup>	1.5 × 10 <sup>5</sup>	1.5 × 10 <sup>5</sup>	1.6 × 10 <sup>5</sup>	1.4 × 10 <sup>5</sup>
Trachoma chlamydia	S-100	1.5 × 10 <sup>5</sup>	<10	<10	<10	<10
	control	7.7 × 10 <sup>5</sup>	7.5 × 10 <sup>5</sup>	7.5 × 10 <sup>5</sup>	7.6 × 10 <sup>5</sup>	7.4 × 10 <sup>5</sup>
Neisseria gonorrhoeae	S-100	1.5 × 10 <sup>5</sup>	<10	<10	<10	<10
	control	5.5 × 10 <sup>5</sup>	5.2 × 10 <sup>5</sup>	5.1 × 10 <sup>5</sup>	3.6 × 10 <sup>5</sup>	2.4 × 10 <sup>5</sup>
Propionibacterium acnes bacillus	S-100	3.8 × 10 <sup>5</sup>	<10	<10	<10	<10
	control	3.8 × 10 <sup>5</sup>	3.5 × 10 <sup>5</sup>	3.4 × 10 <sup>5</sup>	3.0 × 10 <sup>5</sup>	2.8 × 10 <sup>5</sup>

Consideration: Although annihilating the virus that exists in the inside of the body is not assumed, it is thought that it is effective in the virus and bacillus in an infection route.

- 1: The number of bacilli offered as a sample was measured by the formal way of wiping off immediately after adjusting the sample for a measuring shown with the test method (2).
- 2: The number of residual bacilli measured treatment liquid itself and the thing which wiped off the sample plate top layer, after processing the sample plate for 10 minutes with treatment liquid (sample liquid and control liquid).
3. Consideration: the number of residual bacilli after a 10-minute treatment was an elimination factor of

### [About an ESR measuring]

1. Purpose: The electron-spin resonance (ESR) can investigate a concentration distribution of a free radical by measuring an ERS spectrum and processing the obtained spectrum, adding a gradient field at various angles from the outside.  
Therefore, this occurrence status was investigated by carrying out the ESR measuring of the disinfections mechanism that "S-100" which shows reduction nature has.
2. Method: Time is placed and ESR compares distilled Fe2 that stimulates OH radical occurrence was mixed to both, and the radical occurrence status of 1 minute after was measured.
3. Result: although the distilled water was not seen in particular as for the variation, "S-100" generated a lot of OH radical, 1 minute after mixing Fe2.
4. Consideration: although super-return flow is in the usually same status as water, it is conjectured that a likelihood of acting on an organic matter etc. and emitting a lot of OH radical is high.

### [Washing efficiency testing]

#### 1) Degreasing washing

Vacuum grease is applied to a metal surface and the result of having carried out ultrasonic washing for 10 minutes is shown for the validation, critical surface tension was measured using the surface-tension measuring reagent reference solution of the Wako Pure Chem industry.

Detergent		Before washing	After washing
S-100	S-100 70%	32dyn/cm	42dyn/cm
	Denatured alcohol 30%		
	S-100 45%	;	45
	Denatured alcohol 55%		
Conventional detergent	1·1·1 trichloroethane	;	37
	AK225 90%		
	10%		

As mentioned above, "S-100" is boiled markedly and shows the good value. About degreasing washing, an alcoholic concentration shows the value that may be taken for becoming large. Moreover, the value in which a remove of the fluorine system oil that was not able to be removed in 1-1-1 trichloroethane is also almost the same was shown.

#### 2) Surface exfoliation

When the top layer of SUS was ground with abrasive soap, the affected layer was made on the top layer, surface wetting was worsened, and the problem was caused to the adhesion etc. The remove of this deterioration layer was not completed in ultrasonic washing of the conventional chlorofluorocarbon trichloroethane.

Each detergent performed ultrasonic washing for 10 minutes for this thing in which SUS carried out surface polish.

Detergent		Before washing	After washing
S-100	S-100 45%	32dyn/cm	42dyn/cm
	Denatured alcohol 55%		
	S-100 100%	;	50
Conventional detergent	1·1·1 trichloroethane	;	32
	AK225 90%		
		10%	;

The firm affected layer that cannot exfoliate by the organic solvent as mentioned above is removable. This originates in the ability of a cavitation not to get up easily in ultrasonic washing of the organic solvent in the usual status.

#### 3) A surface residue

Each detergent performed ultrasonic washing for what ground metal surfaces other than SUS with metals abrasive soap for 10 minutes, and surface residue was measured with the microbalance. Before washing, the residue of about 1 mg/cm<sup>2</sup> (50mg/50cm<sup>2</sup>) exists.

Detergent		residue
S-100	S-100 70%	0.2 μg/cm <sup>2</sup>
	Denatured alcohol 30%	
	S-100 100%	
Conventional detergent	1·1·1 trichloroethane	1.2
	AK225 90%	14.8
	10%	

This is also markedly boiled compared with the conventional detergent as mentioned above, and shows the good value.

"S-100" or the mixed solvent of "S-100" has very big washing power compared with the conventional chlorofluorocarbon trichloroethane as mentioned above. Moreover, it is also the special feature not to cause environmental destruction like chlorofluorocarbon at all, but to obtain the outstanding agent for washing according to an intended use simply.

### **[About ultrasonic washing]**

Generally, the washing thing is used in order for the collision energy of the liquid fine particles by a ultrasonic wave to wash the dirt of oil and fats, the abradant, and medicine which mainly adhere to a metals, a lens, a glass, a plastics, IC platform mechatronics parts, etc. for a short time. If water amounts to 100 degrees C daily, it will be boiled, but when a hydrostatic pressure is lower than an atmospheric pressure, normal temperature also changes from a liquid phase to a vapour phase. Thus, the liquid of normal temperature is exposed to a low-voltage environs, and boils, and the event in which the air bubbles collapse is called cavitation. While air bubbles generate in water the cavitation cut according to an ultrasonic wave and offering a retroaction place (thousands of degrees C or more or 1,000 atmospheres or more) at the time of collapse, the fall of a temperature occurs rapidly by a cellular interface. There is the big special feature that ultrasonic washing is excellent in using these events. However, there is also a substance that does not fit all washing and is not suitable depending on a washing thing. Moreover, the air bubbles of a cavitation [ / near the surface of a wall] generate a liquid micro jet or an impulse wave at the time of the collapse, and the washing thing damage by cavitation erosion may be caused. Moreover, since this cavitation generates an electric energy and is charged qualitatively of an insulator, it will make washing thing vapor-deposit dirt like a static electricity. Therefore, in ultrasonic washing, a selection of cleaning fluid serves as an important key. Although the solvent and the surfactant have been conventionally used for washing, in washing power, a dirt re-adhesion preventing, an antistatic, an environmental problem, an economical efficiency, convenience, etc., it is markedly alike and "S-100" is not only excellent, but does not cause the washing thing damage or the re-adhesion by cavitation erosion by experiment.

Although the company which uses common electrolytic alkali ion water as rinse water in ultrasonic washing can see these days, the alkali ion water which electrolyzed "NaCl" as an electrolyte does not fit ultrasonic washing. A photograph is the result of carrying out by using common electrolytic alkali ion water as rinse water for SUS304, and repeating ultrasonic washing. If X line analysis carries out an etching metal portion, a chloride other than usual nickel, Cr, and Fe will exist, and Na, Cl, and O will be detected in an analysis of electrolytic water remnants.



Moreover, a crystal peculiar to NaCl depositing in the evaporation remnants neglected for about ten days, and meaning the magnitude of a salt concentration and mixing is understood. Therefore, it became clear that the main ingredients of these electrolytics water were NaOH and HCl. Moreover, this event bears a

strong resemblance to the status that sodium hydroxide was put into seawater, and it can be said that it is under the environs where it is the easiest to cause a metals etching. First, the passive state film of SUS is destroyed by stimulus of the cavitation by an ultrasonic wave by NaOH, and Fe under the destroyed passive state film begins to corrode these mechanisms by Cl. Moreover, it is thought that especially the intense fractions of the etching caused damage by cavitation erosion by occurrence of the liquid micro jet or the impulse wave.

### **[About the agricultural field]**

As a result of diluting "S-100" 30 to 50 times, carrying out a foliar application every morning and experimenting in it with no agrochemicals and non-manure (soil -- water), the leaf grew healthily and there was no damage caused by illness or a noxious insect. By carrying out a foliar application, the whole unit-of-measure crystal of the mineral which ion water has is connected by an ionic bond disinfection washing of the leaf is not only carried out, but, and this emits electrons with the moderate macromolecular. And the coupling with the proton emitted from the sun is performed on the surface of a leaf, and it is thought that EC also becomes high simultaneously. Moreover, these events promote photosynthesis, a lot of moisture is pumped up originally, and in order to compound an organic compound with the carbon dioxide and moisture that are absorbed from a leaf, glucose is generated in large quantities. Moreover, if night comes, since water has the property to flow into the higher one from the low place of a temperature, besides the event by EC, it will be commutated toward the ground heated at daytime from the atmosphere with a low temperature. Then, the nutrition (glucose) obtained by photosynthesis is also commutated to a root from a leaf, and a growth of a root is promoted. When a root grows, it is thought that it will become easy to supply moisture from soil, and photosynthesis in the daytime will be helped more. Therefore, since immunity power becomes high and healthy and strong a root and a leaf, and fruits grow up by performing this business every day, illness and a noxious insect are prevented and farming without agricultural chemicals becomes possible. Moreover, it seems that soil is also improved by a growth of a root, and falloff of nitrate nitrogen by no agrochemicals. Although nitrogen and a phosphoric-acid potassium were indispensable conditions as manure in the agricultural technique theory by the present, neither agricultural chemicals nor manure was used in this experiment. Most of an original sorption is only water, and nitrogen was absorbed together with the carbon dioxide, when photosynthesis was performed, and the phosphoric-acid potassium could assume that it was required only for soil improvement, and became backing of hydroponics. That is, since the plant that became healthy by photosynthesis generates glucose in large quantities and itself has a

germicidal action, an effect is demonstrated to illness or a noxious insect and it is thought that immunity power became high. Moreover, harvest time is brought forward at the same time the sugar content of vegetables or fruit becomes high and crop yields increase, and it seems that the freshness maintenance after harvest also goes up.

### **[The medical application study of super-alkali ion water obtained by electrolytic process]**

Since cell trouble nature will appear if these are applied to humans although it generally has various usefulness with it, such as a germicidal action, a detergent action, and a solubilization action, the medical application of the solution which shows strong alkali nature is not yet carried out. Then, we examined the medical application paying attention to "the super-alkali ion water" with which system stimulativeness is hardly seen and which made hydroxide ion superfluous physically. This time, we examined these pH stabilities, skin trouble nature, antacid ability, a skin transparency facilitation action, and disinfection. The way titrated 0.1N hydrochloric acid and evaluated antacid ability. The MTT testing estimated skin trouble nature using the three-dimensional cultured skin model. The skin transparency facilitation action was evaluated from the in vitro transparency experiment of several sort medicine using the abdomen skin of hairless rat. Disinfection carried out mixed culture of the ion water to culture solution, and after that, sowing of it was carried out to the agar double ground, and it measured and evaluated the colony count.

As a result, "S-100" showed outstanding pH stability. Moreover, most skin trouble nature was not seen. Therefore, it seemed that these ions water "S-100" is an additive, which can be used for medical treatment stably safely. Furthermore, antacid ability of 100ml of these ions water "S-100" was equivalent to 0.336g of bicarbonate of soda, and was made promising as an antacid new type that does not need the care about the acidosis by Na<sup>+</sup>. Moreover, ion water "S-100" was excellent in the percutaneous absorption nature of a basic medicine. Finally, it was suggested that it is applicable as an additive with which the oral medicine and the medicine for external application were excellent in convenience since ion water "S-100" also had the sterilizing effect to the microbe variously.

Literature: Plain Atsushi, Shuji Ito, Tetsuya Hasegawa, and Sugibayashi Kenji "120th annual convention of Pharmaceutical Society of Japan" 20[processor-element] 10-23 2000

### **A consideration and a consequent**

Common electrolytic alkali ion water can be divided into the object for drinks, and industry. If the solution of sodium chloride (NaCl) is generally electrolyzed using a diaphragm so that it may see by the object for industry, sodium hydroxide (NaOH) liquid will be generated by the cathode room around hydrogen and a pole. This is appointed as a manufacturing process of sodium hydroxide by the diaphragm process of the electrolyzing method, condenses and boils down the generated sodium hydroxide liquid, and has finished it as a solid now. Therefore, the alkali ion water for industry is around pH 12, and he sees it from a failure event etc., and can understand that it is almost equivalent to 0.1 N NaOH, and the property is also well alike. Of course, it cannot drink. Moreover, also in the field of washing, it is a melting type, and when performing ultrasonic washing, a metaled passive state film is destroyed by stimulus of a ultrasonic wave etc. in a washing thing or a thing to be washed, and the result which causes the etching under a passive state film further is produced. Furthermore, at the anode plate room of an electrolysis vessel, since acid water is generated simultaneously, various problems arise in the treatment. First, the toxicity of ozone and gaseous chlorine which occur during electrolytic water production is well known, and in order that chlorine may react with the small halogenated compound of electronegativity and may generate a halogen object further rather than chlorine, it has unfathomable influence on a human body. Moreover, the ozone generated during that these electrolytic water not only has a harmful effect to a human body, but the true character of super-acid water acquired by the electrolytic is hypochlorous acid and the gaseous chlorine which occurs from an electrolytic device, or a generation has a problem of making almost all the metales in an equipment or the interior of a room corrode etc. Moreover, even if it mixes the acid water obtained by the electrolytic with the alkaline water obtained simultaneously, it becomes neutrality, but since it is not neutralized, many problems produce chlorine etc. in liquid waste treatment etc. There is not only a problem to the influence on these washing thing or a thing to be washed, a safety, or an environs, but using an electrolytic generation machine by washing for industry has many problems in the quality control, the timeproductive, the equipment maintenance, and the total cost, etc. Moreover, since sodium chloride (NaCl) is not used as an electrolyte, sodium hydroxide (NaOH) liquid is not generated (pH8-pH8.5), but since it is safe, the electrolytic alkali ion water for drinks can be drunk. However, washing power is completely ineffective.

Although the measure of an electrolytic is used for negative ion water "S-100" in the production method, a property completely differs from common alkali ion water. While "S-100" obtains complicated treatments, such as an electrolytic surface preparation of water, a special electrolyte, an electrolysis vessel, and a post processing (stabilizing treatment), and is generated and it has safety of a drinking water level, It has the performances, such as a high hydroxide

ion concentration, the outstanding stability, the effect that prevents rust, the effect which prevents mold, the preservation-from-decay effect, the corrosion control effect, the antistatic effect, the re-adhesion preventing effect, a sterilizing effect, and odor eliminating, like the result in an experiment. Furthermore, unlike dissolved types, such as a synthetic surfactant, common electrolytic alkali ion water for industry (sodium hydroxide solution), and a solvent, in washing, it can be called the cleaning fluid new type which affects neither a washing thing nor a thing to be washed for the exfoliation type using an electronic repulsion. Moreover, it was thought that a lot of electrons were held in the solution of electrolyzed "S-100", and this hydroxide ion (OH-) and oxidation reduction potential produced the event (the antistatic and re-adhesion preventing) and exfoliation event facilitatory effect by an intermolecular force, and have produced the quick and powerful exfoliation washing effect. Moreover, even if it filters unlike detergent or a solvent, it is also the big special feature for the concentration of hydroxide ion not to fall, but to circulate and for it to be able to reuse. That is, in washing for industry, washing power, a safety, and the ease of treating have extracted the group, and are considered to contribute also to global environment problems, such as water saving and waste fluid, greatly. Furthermore, not only the industrial field but the application to broad fields, such as the medical fields, such as medical supplies, the cosmetics field, the food field, and the agricultural field, is expected.