

METHOD OF PRODUCING ALKALINE OXYGENATED WATER

Technical Field

The present disclosure relates to a method of producing alkaline oxygenated water and a
5 device used for producing alkaline oxygenated water.

Background

It has been of wide interest to produce oxygenated water. A method of producing oxygenated
water would include passing purified and softened water through an electrolytic cell where a
10 portion of water molecules gets separated into hydrogen molecules and oxygen molecules.
The dissolved oxygen level is approximately 20 to 25 parts per million (ppm). Subsequently,
the water enters a sparging unit where the water flows down on a spiral concourse. Oxygen is
supplied into the solution during the sparging process in order to increase the oxygen level to
50 – 60 ppm.

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Another method of producing oxygenated water includes multiple steps, for example,
receiving water from a water source, preconditioning the water for an electrolysis process,
performing the electrolysis process on the preconditioned water to produce alkaline water,
combining the alkaline water with oxygen, spinning the alkaline water/oxygen combination,
20 outputting superoxygenated and structured water, supplying the water into a coil system,
passing the water therethrough, combining the outputted water from the coil system with
structured ozone, inputting the combined water and structured ozone into a multicoil system,
passing the water therethrough and outputting superoxygenated, structured water.

25 Oxygenated water can also be produced by passing hydrogen peroxide in aqueous solution
form through a device containing a hydrogen peroxide decomposition catalyst.

Another method of increasing the quantity of dissolved oxygen in water includes adding an
oxidant to the water to increase an oxidation reduction potential (ORP) of the water, and
30 subsequently generating oxygen gas by electrolysis.

These previous methods for producing oxygenated water generally include an electrolysis process on water and/or combination of oxygen into the water. These methods are relatively complicated, time consuming, or expensive.

5 Summary

The previous methods for producing alkaline oxygenated water involve complicated, time-consuming, or expensive processes. An object of the invention is to provide a simple and cost effective method for producing alkaline oxygenated water.

- 10 According to one aspect of the present disclosure, a method of producing alkaline oxygenated water is disclosed. The method of producing alkaline oxygenated water comprises contacting purified water with gas phase oxygen anion to produce the alkaline oxygenated water with a concentration of dissolved oxygen anions and/or derivatives greater than 9.5 mg/l. In some embodiments, the concentration of the gas phase oxygen anions is greater than 0.3×10^3 counts/cm³. In further embodiments, the concentration of the gas phase oxygen anions ranges between $0.3 \times 10^3 - 4 \times 10^6$ counts/cm³.

In some embodiments, the contacting step is performed at a pressure greater than atmospheric pressure.

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In some embodiments, the concentration of the dissolved oxygen anions and/or the derivatives in the alkaline oxygenated water is 15 – 35 mg/l.

- 25 In some embodiments, the derivatives comprise oxygen dissolved in the purified water by way of the contacting step. In some embodiments, the concentration of the oxygen in the alkaline oxygenated water ranges between 15 – 35 mg/l.

- 30 In some embodiments, the alkaline oxygenated water is at a pH level of 7.5 – 8.5. The alkaline oxygenated water has oxidation reduction potential (ORP) ranging between 250 – 360 mV.

In some embodiments, the produced alkaline oxygenated water is enabled to retain the dissolved oxygen anions and/or the derivatives at a concentration not lower than 23.5 mg/l within 180 minutes upon completion of the contacting step.

- 5 In some embodiments, the produced alkaline oxygenated water is enabled to retain the dissolved oxygen at a concentration not lower than 23.5 mg/l within 180 minutes upon completion of the contacting step.

In some embodiments, the purified water is either distilled water or cold boiled water.

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In some embodiments, the method of producing alkaline oxygenated water further comprises a step of stirring the purified water that may facilitate dissolution of the oxygen anions.

15 **Brief Description of the Drawings**

FIG. 1 shows a flow chart for an illustrative method of producing alkaline oxygenated water in accordance with some embodiments of the present disclosure.

FIG. 2 shows a flow chart for an illustrative method of producing alkaline oxygenated water in accordance with further embodiments of the present disclosure.

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FIG.3 is a cross-sectional view of an illustrative device for producing alkaline oxygenated water in accordance with some embodiments of the present disclosure.

FIG. 4 is a cross-sectional view of an illustrative device for producing alkaline oxygenated water in accordance with further embodiments of the present disclosure.

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FIG.5 is a cross-sectional view of an illustrative device for producing alkaline oxygenated water in accordance with further embodiments of the present disclosure.

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FIG. 6 shows an illustrative container covered by a lid upon completion of the contacting step in accordance with some embodiments of the present disclosure.

Detailed Description

Hereinafter, the disclosed method and device of producing alkaline oxygenated water shall be described according to the preferred embodiments of the present disclosure and by referring to the accompanying description and drawings. However, it is to be understood that the description of the preferred embodiments for the method and device of producing alkaline oxygenated water described herein and the drawings are merely to facilitate discussion of the disclosed method and device of producing alkaline oxygenated water. It is envisioned that those skilled in the art may devise various modifications without departing from the scope of the appended claim.

According to one aspect of the present disclosure, a method 10 for producing alkaline oxygenated water is disclosed (as shown in FIGs. 1 – 2). The method 10 comprises a step 110 of contacting purified water 220 with gas phase oxygen anions to produce alkaline oxygenated water with a concentration of dissolved oxygen anions and/or derivatives greater than 9.5 mg/l. In some embodiments, the gas phase oxygen anions are in a concentration greater than 0.3×10^3 counts/cm³. In some embodiments, the concentration of the gas phase oxygen anions ranges between 0.3×10^3 and 4×10^6 counts/cm³. Step 110 is performed at a pressure greater than atmospheric pressure.

In some embodiments, the step 110 can comprise injecting the gas phase oxygen anions into the purified water 220 using at least one tube/pipe 210 to bring the gas phase oxygen anions into contact with the purified water 220 (FIG. 3). Each of the at least one tube/pipe 210 has one end which is connected to an outlet of an oxygen anion source 230 and the other end which is inserted into the purified water 220. The gas phase oxygen anions flow along the channel of the tube/pipe 210 and contact with the purified water 220, producing the alkaline oxygenated water.

In some other embodiments, the step 110 can include ejecting the gas phase oxygen anions into the purified water 220 from at least one air ejector 210, to bring the gas phase oxygen anions into contact with the purified water 220 in order to produce alkaline oxygenated water. As shown in FIG. 4, the at least one air ejector 210 is located at the bottom of the container 240. The gas phase oxygen anions can be ejected in an upward direction into the purified water 220 so that the gas phase oxygen anions move through the purified water 220 from the

bottom portion of the water to the top, and contact with the purified water 220 to produce alkaline oxygenated water. The bubbling movement of the gas form oxygen anions through the water improves the dissolution of the gas phase oxygen anions in the purified water 220. In further embodiments, the air ejector 210 can be located at various places of the container 240 to eject the gas phase oxygen anions in diverse directions. The at least one air ejector 210 is connected to the oxygen anion source 230. The number, size and configuration of the at least one air ejector 210 can be varied and designed to increase the contacting surface between the gas phase oxygen anions and the purified water 220 in order to facilitate the step 110. It would thus enhance the efficiency of the dissolution of the gas phase oxygen anions in the purified water 220 and the production of the alkaline oxygenated water.

The purified water 220 can be any water that is suitable for drinking. For example, the purified water 220 can be distilled water, cold boiled water, filtered water, or deionized water. Purified water 220 is produced by processes such as capacitive deionization, reverse osmosis, carbon filtering, microfiltration, ultrafiltration, ultraviolet oxidation, or orelectrodeionization. Combination of a number of these processes can be used to produce purified water. High purity of the purified water can be reached with contaminants in parts per billion (ppb) or parts per trillion (ppt). The temperature of the purified water 220 can range from 10°C to 30 °C. Preferably, the temperature of the purified water 220 ranges from 20 °C to 27 °C. In some embodiments, the purified water 220 can be held in a container 240. The container 240 can be covered with a lid 270 for sealing the container 240. The oxygen anion source 230 can be an oxygen anion generator, an air anion generator, or a container which stores oxygen anion.

In some embodiments, the method 10 of producing alkaline oxygenated water further comprises generating oxygen anions 100 by an oxygen anion generator 230 (FIG. 1).

In some embodiments, the method 10 of producing alkaline oxygenated water can include generating oxygen anion 100 by an air anion generator 230. The air anion generator 230 can use alternating current (AC) voltage as a power supply and air as a base substance (FIG. 2). The air anion generator 230 can use high voltages to ionise (i.e., electrically charging) air molecules. Negative ions, or anions, are particles with one or more extra electrons, conferring a net negative charge to the particle. The air anion generator 230 can use Pressure

Swing Adsorption (PSA) technology to make up a high purity anion. The method for generating oxygen anion 100 can further comprise multiple steps, for example, a first level filtering step, a second level filtering step, a compressing step, a cooling step, and another filtering step using molecular sieves. The gas phase nitrogen can be filtered so that only the gas phase oxygen anions are supplied. A pressure regulating valve may be used to control the pressure of the gas phase oxygen anions at a pressure level greater than an atmospheric pressure. The air anion generator 230 requires an AC voltage of $220\text{ V} \pm 22\text{ V}$ with a frequency of $50\text{ Hz} \pm 1\text{ Hz}$. The air anion generator 230 can work in an environment having temperature levels that ranges between $6\text{ }^{\circ}\text{C} \sim 40\text{ }^{\circ}\text{C}$, a relative humidity that ranges between 30% ~ 85%, a pressure level that ranges between 70 kPa ~ 106 kPa, without having any presence of corrosive gas and a relatively strong magnetic field nearby. The anion flow can range between 1 ~ 5 L/min.

The density of generated gas phase oxygen anion can also be variable. In some embodiments, the concentration or density of the gas phase oxygen anions can be more than 0.3×10^3 counts/cm³. In some embodiments, the concentration or density of the gas phase oxygen anions can range from 0.3×10^3 to 4×10^6 counts/cm³.

In some embodiments, the concentration of the dissolved oxygen anions and/or the derivatives in the alkaline oxygenated water can range between 15 – 35 mg/l. The derivatives can comprise oxygen dissolved in the purified water 220 by way of the step 110. In particular, the concentration of the dissolved oxygen in the alkaline oxygenated water ranges between 15 – 35 mg/l. The alkaline oxygenated water has a pH value ranging between 7.5 – 8.5. The oxidation reduction potential (ORP) value of the alkaline oxygenated water ranges between 250 – 360 mV. ORP, or Redox Potential, is a measurement of the ability of water to oxidize contaminants. The higher the ORP is, the greater the number of oxidizing agents is.

In some embodiments, when the gas phase oxygen anions contact with the purified water 220, hydroxide ion (OH⁻) and oxygen may be generated. The represented chemical reaction equation may be $4\text{O}_2^- + 2\text{H}_2\text{O} = 4\text{OH}^- + 3\text{O}_2$. Hence the purified water 220 becomes alkaline oxygenated water with a higher pH value and an increased dissolved oxygen concentration. The concentration of dissolved oxygen in the alkaline oxygenated water is more than 9.5 mg/l.

As the step 110 is undergoing, more of gas phase oxygen anions may contact with the purified water 220 and as a result more of the hydroxide ions (OH^-) and oxygen may be generated. The chemical reaction equation may be $4\text{O}_2^- + 2\text{H}_2\text{O} = 4\text{OH}^- + 3\text{O}_2$. Hence, the pH value and oxygen level of the generated alkaline oxygenated water increases further as the step 110 is being executed or implemented. In accordance with an embodiment of the present disclosure, the concentration level of the dissolved oxygen in the alkaline oxygenated water can reach up to 35 mg/l and the pH value of the alkaline oxygenated water can reach up to 8.5.

After a period of time, the oxygen contained in the generated alkaline oxygenated water may get saturated, and the oxygen anions may stop to react with the purified water 220 to convert into hydroxide ion (OH^-) and oxygen. As a result, the pH value and the oxygen level will remain the same after the oxygen contained in the water reaches the saturated level, even when the step 110 continues. For 200 ml purified water 220, it can take approximately 6 mins for the dissolved oxygen to reach a saturated level in the alkaline oxygenated water using the method 10, in accordance with an embodiment of the present disclosure. In another embodiment, for 500 ml purified water 220, approximately 10 mins may be needed for the dissolved oxygen to reach a saturated level in the generated alkaline oxygenated water using the method 10. In a third embodiment, for 1500 ml purified water 220, approximately 30 mins may be required for the oxygen to become saturated in the generated alkaline oxygenated water using the method 10.

Accordingly, one can choose to end or suspend the step 110 after the oxygen is saturated in the oxygenated water. In other words, there is no gas phase oxygen anion contacting with the purified water 220. However, one can choose to continue with contacting the gas phase oxygen anions with the purified water 220. In addition, one can also choose to end or suspend the step 110 before the oxygen is saturated in the alkaline oxygenated water.

In an embodiment, the method 10 of producing alkaline oxygenated water can comprise a controlling step 120. The controlling step 120 controls to suspend or end the step 110 at a predetermined time or upon the decision of an individual user. The controlling step 120 controls to suspend or discontinue the step 110 by suspending or discontinuing the supply of the gas phase oxygen anions. The controlling step 120 can also control to suspend or stop

step 110 by suspending or stopping the flow of gas phase oxygen anions into the purified water 220.

It is preferred to continuously have the gas phase oxygen anions contacting the purified water 220 to produce the alkaline oxygenated water. However, the step 110 can be non-continuous or intermittent during a predetermined time period.

In some embodiments, the produced alkaline oxygenated water may be able to retain the dissolved oxygen anions and/or the derivatives at a concentration not lower than 23.5 mg/l within 180 minutes upon completion of the step 110. In particular, the produced alkaline oxygenated water is enabled to remain the dissolved oxygen at a concentration not lower than 23.5 mg/l within 180 minutes upon completion of the step 110.

The pH value and the oxygen level of the alkaline oxygenated water are enabled to stay above a certain desirable level although the pH value and oxygen level may decrease over time after the oxygen anions ceases to contact with the purified water 220. In some embodiments, the alkaline oxygenated water is enabled to retain its pH value higher than 7.6 and keep the concentration of the dissolved oxygen anions and/or the derivatives above 23.5 mg/l within 180 minutes upon completion of the step 110. In some embodiments, the derivatives can comprise oxygen dissolved in the purified water 220 by way of the step 110. The produced alkaline oxygenated water is enabled to retain the dissolved oxygen at a concentration not lower than 23.5 mg/l within 180 minutes upon completion of the step 110. In other words, the produced alkaline oxygenated water can keep its dissolved oxygen concentration higher than 23.5 mg/l for at least 180 mins. In order to retain the pH value and dissolved oxygen level of the alkaline oxygenated water for a longer time, it is preferred to put a lid 270 to cover and/or seal the container 240. The produced alkaline oxygenated water may be used at any time after the step 110 starts. Preferably, the produced alkaline oxygenated water is used immediately after the completion of step 110, when optimal oxygen level and pH value is reached, or at least within 3 hours upon completion of step 110.

In accordance with one embodiment of the present disclosure, the step 110 for contacting the gas phase oxygen anions with 500 ml distilled water 220 lasts for 10 mins to produce alkaline

oxygenated water. The pH value, oxygen level and ORP of the alkaline oxygenated water are measured at different points of time since the step 110 begins at time 0 min.

Table 1 lists the pH value, dissolved oxygen level and the oxidation reduction potential (ORP) of the alkaline oxygenated water measured at different points of time since the gas phase oxygen anions start to contact with 500 ml distilled water 220, The concentration of the gas phase oxygen anions is 0.6×10^3 counts/cm³.

Time (min)	pH	Oxygen level (mg/l)	ORP (mV)
0	7.49	8.25	385
10	8.19	28.15	359
60	7.89	30.10	347
180	7.60	23.70	320

Table 1 - pH value, oxygen level and oxidation reduction potential (ORP) of the alkaline oxygenated water measured at different points of time after the gas phase oxygen anions starts to contact with 500 ml distilled water.

The step 110 starts at time 0 min and lasts for 10 mins. The pH value at time 0 min is approximately 7.5 and the oxygen level is approximately 8.3 mg/l, as shown in Table 1. After 10 mins, the step 110 stops, no more oxygen anion gets into contact with the purified water 220. As further shown in Table 1, the pH value at time 10 min is measured as approximately 8.2 and the oxygen level is measured as approximately 28.2 mg/l. At time 60 min, the pH value is approximately 7.9 and the oxygen level is approximately 30.1 mg/l. At time 180 min, the pH value is approximately 7.6 and the oxygen level is approximately 23.7 mg/l. It is worth noting that for 10 mins time of simply contacting purified water 220 with gas phase oxygen anions, 500 ml alkaline oxygenated water is generated with a dissolved oxygen concentration ranging between 15 – 35 mg/l and a pH ranging between 7.5 – 8.5. Furthermore, the dissolved oxygen concentration of the generated alkaline oxygenated water can keep above 23.5 mg/l for a long time of approximately 3 hours. The oxidation reduction potential (ORP) may decrease gradually with a passage of time as shown by ORP values at time 10 min, 60 min, and 180min.

The method 10 of producing alkaline oxygenated water is advantageous as it is simple and can be completed in a short time. For example, in order to produce 200 ml alkaline oxygenated water with the dissolved oxygen concentration as 15 – 35 mg/l and pH as 7.5 – 8.5, only 6 mins of contacting (i.e., step 110) is required (the density of the air anions was set as 0.54×10^3 counts/cm³). Further examples in accordance with various embodiments in the present disclosure include 10 mins of contacting (i.e., step 110) for 500 ml alkaline oxygenated water and 30 mins of contacting (i.e., step 110) for 1500 ml alkaline oxygenated water. The short time required for contacting (i.e., step 110) makes the method 10 more efficient and cheaper compared to other methods. The time required for contacting (i.e., step 110) can be further reduced if parameters such as oxygen anions density are increased. Table 2 lists the time required for the contacting (i.e., step 110) in order to produce different volume of alkaline oxygenated water with the dissolved oxygen concentration as 15 – 35 mg/l and pH as 7.5 – 8.5, in accordance with some embodiments of the present disclosure.

Water Volume	Time Required
200 ml	6 mins
500 ml	10 mins
1500 ml	30 mins

Table 2 - Time required for the contacting step in order to produce different volume of alkaline oxygenated water with the dissolved oxygen level as 15 – 35 mg/l and pH as 7.5 – 8.5.

The produced alkaline oxygenated water in accordance with some embodiments of the present disclosure can maintain its pH and oxygen level above desirable level for a long period of time. The alkaline oxygenated water can maintain its pH value above 7.6 and maintain its oxygen level above 23.5 mg/l for 3 hours or longer.

It is preferred that the step of generating oxygen anion can be carried out simultaneously with contacting the oxygen anion with purified water 110. While the contacting step 110 is taking place, new oxygen anion is being generated.

- 5 The method 10 of producing alkaline oxygenated water further comprises directing purified water 220 into contact with oxygen anion 130 and directing alkaline oxygenated water out for use 140. The process of inputting purified water 130, the process of outputting alkaline oxygenated water 140 and the process of contacting purified water with oxygen anion 110 can be performed simultaneously. In this way, the efficiency of producing the alkaline oxygenated water is greatly increased, as the process of directing purified water into contact with oxygen anion and the process of directing alkaline oxygenated water out for use are carried out simultaneously. The flow rate of inputting purified water, the flow rate of outputting alkaline oxygenated water, and the flow rate of inputting gas phase oxygen anions, the density of gas phase oxygen anions, and the contacting surface between the purified water 10 220 and the gas phase oxygen anions, can be adjusted to reach a maximum oxygen level and pH value of the output alkaline oxygenated water. There is no waiting time for outputting the produced alkaline oxygenated water, and inputting new purified water 220 before producing new alkaline oxygenated water.
- 15 20 In some embodiments, the method of producing alkaline oxygenated water can further comprise stirring the purified water 220 to facilitate dissolution of the gas phase oxygen anions.

According to another aspect of the present disclosure, a device 20 of producing alkaline oxygenated water is disclosed. In one embodiment, the device 20 of producing alkaline oxygenated water can comprise a unit configured for contacting oxygen anion with the purified water. The unit can be at least one tube/pipe 210 inserted into the purified water 220 for directing the gas phase oxygen anion to bring the gas phase oxygen anion into contact with the purified water 220 to produce alkaline oxygenated water (FIG. 3). Alternatively, the unit can be at least one air ejector 210 for ejecting the gas phase oxygen anion into the purified water 220, to bring the gas phase oxygen anion into contact with the purified water 220 to produce alkaline oxygenated water (FIG. 4). The at least one air ejector 210 can be connected to the oxygen anion source.

For a number of embodiments, the device 20 further comprises a container 240 for holding the purified water 220. The container 240 is preferably non-metallic, e.g. plastic, etc. The device 20 can further comprise at least one inlet 250 for the purified water 220 to flow into the container 240 and at least one outlet 260 for the alkaline oxygenated water to flow out of the container 240. This establishment facilitates a constant supply of alkaline oxygenated water from the outlet 260 of the container 240 by continuously flowing the purified water 220 into the container 240, contacting the gas phase oxygen anions with the purified water 220 in the container 240, producing and outputting alkaline oxygenated water. FIG. 5 shows a device 20 for producing alkaline oxygenated water in accordance with some embodiments of the present disclosure. As shown in FIG. 5, the device 20 includes a container 240 having a side wall and a bottom, an inlet 250, an outlet 260, at least one air ejector 210. The inlet 250 and the outlet 260 are located on the side wall of the container 240. The at least one air ejector 210 is positioned at the bottom of the container 240. Purified water 220 flows into the container 240 via the inlet 250. Gas phase oxygen anions are ejected in an upward direction into the purified water 220 so that the gas phase oxygen anions contact with the purified water 220 to produce alkaline oxygenated water. The produced alkaline oxygenated water flows out from the container 240 via the outlet 260. A collecting device can be used to collect the produced alkaline oxygenated water flowing out from the container via the outlet 260 for subsequent use.

The shape of the container 240, the number, size, configuration and location of the at least one air ejector 210, the at least one inlet 250, and the at least one outlet 260 may be modified, adjusted, varied in accordance with various embodiments of the present disclosure. The purpose of the modification and/or variation is to maximize the contacting surface between the gas phase oxygen anions and the purified water 220, in order to facilitate the step 110, readily understood by persons skilled in the relevant art. The step 110 is facilitated in order to achieve maximum dissolved oxygen concentration and pH value of the output alkaline oxygenated water.

The produced alkaline oxygenated water can be used immediately after the completion of the step 110. It can also be stored in the container 240 or transferred to another container, preferably non-metallic container such as plastic bottle. In order to retain the pH value and

dissolved oxygen level of the alkaline oxygenated water for a longer time, it is preferred to put a lid 270 to cover and/or seal the container 240. FIG. 6 shows an illustrative container 240 covered by a lid 270 upon completion of the step 110 in accordance with some embodiments of the present disclosure.

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The alkaline oxygenated water produced can be used for health care, cosmetics, disinfection and medical treatment. Alkaline oxygenated water can deliver increased concentration of dissolved oxygen to the surfaces to which the alkaline oxygenated water is exposed, such as tissue surface of human and animal. Bacteria exposed to alkaline oxygenated water can be

10 killed through the oxidation of the polysaccharide cell walls of the bacterial organism. The alkaline oxygenated water can also be applied to human skin for skin care and/or skin treatment, or taken in by human for health purpose or for medical treatment of diseases such as cancer, leukemia, high blood pressure, high cholesterol, and etc.

15 It is to be understood that the present disclosure may be embodied in other specific forms and is not limited to the sole embodiment described above. However modification and equivalents of the disclosed concepts such as those which readily occur to one skilled in the art are intended to be included within the scope of the claims which are appended thereto.

Claims

1. A method of producing alkaline oxygenated water comprising:
generating gas phase oxygen anions by an air anion generator using pressure swing
5 adsorption and using AC voltage of $220\text{ V} \pm 22\text{ V}$ to ionise air molecules; contacting
purified water with a flow of gas phase oxygen anions at a pressure greater than
atmospheric pressure to produce the alkaline oxygenated water with a concentration
of dissolved oxygen anions and/or derivatives greater than 9.5 mg/l ;
suspending the flow of gas phase oxygen anions into the purified water when an
10 oxygen concentration in the alkaline oxygenated water reaches a predetermined level;
wherein the derivatives comprise oxygen dissolved in the purified water by way of the
contacting step;
wherein the concentration of the dissolved oxygen in the alkaline oxygenated water is
15 $15 - 35\text{ mg/l}$.
2. The method of claim 1, wherein the alkaline oxygenated water is at a pH of $7.5 - 8.5$.
3. The method of claim 1, wherein the alkaline oxygenated water has oxidation-
20 reduction potential (ORP) ranging between $250 - 360\text{ mV}$.
4. The method of claim 1, wherein the produced alkaline oxygenated water is enabled
to retain dissolved oxygen at a concentration not lower than 23.5 mg/l within 180
minutes upon completion of the contacting step.
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5. The method of claim 1, wherein the purified water is distilled water or cold boiled
water.
6. The method of claim 1, further comprising a step of stirring the purified water to
30 facilitate dissolution of the gas phase oxygen anions.
7. The method of claim 1, wherein the predetermined level is saturation.

8. The method of claim 1, wherein the predetermined level is greater than saturation.

9. The method of claim 1, wherein the predetermined level is less than saturation.