CLAIMS

1. A method for preparing an oxidant biocide enriched in oxygen-centred free radicals, wherein a biocide compound containing a peroxide-type bond wherein said biocide has a concentration of at least 1% by weight is irradiated with an UV lamp so to generate a percentage of oxygen-centred free radicals higher than the percentage present in the non irradiated biocide.

2. The method according to claim 1, wherein said biocide containing a peroxide-type bond is selected form peracetic acid, TAED, hydrogen peroxide, sodium hypochlorite, calcium hypochlorite, chlorine dioxide, ozone, bromine and bromine chloride, myristic, oleic, laurilic amine oxides, performic acid, perlauric acid, mono-perglutaric acid, peroxide phthalic acid, perborate, permanganate, peroxide monophosphate or mixtures thereof.

3. A method for sterilizing waters comprising the following steps:

i) at least one step wherein a biocide compound containing a peroxide-type bond, or a mixture of biocide compounds containing a peroxide-type bond wherein said biocide or said mixture of biocides has a total concentration of at least 1% by weight, is irradiated with an UV lamp so to generate a percentage of oxygen-centred free radicals higher than the percentage present in the non irradiated biocide before its use in waters to be treated and

ii) at least one step wherein the biocide obtained in step i), is introduced in the waters to be treated.

4. A method for controlling the colonisation of micro-organisms in waters comprising the following steps:

I) at least one step wherein a biocide compound containing a peroxide-type bond, or a mixture of biocide compounds containing a peroxide-type bond wherein said biocide or said mixture of biocides has a concentration of at least 1% by weight, is irradiated with an UV lamp so to generate a percentage of oxygen-centred free radicals higher than the percentage present in the non irradiated biocide before its use in waters to be treated and;

II) at least one step wherein the biocide obtained in step i), is introduced in the waters to be treated; and

iii) at least one step of monitoring said micro-organisms in the waters to be treated and/or in the waters treated.

5. A method for controlling and/or preventing the colonisation by aquatic filtering organisms on the surfaces of submerged structures comprising the following steps:

i) at least one step wherein a biocide compound containing a peroxide-type

bond, or a mixture of biocide compounds containing a peroxide-type bond wherein said biocide or said mixture of biocides has a concentration of at least 1% by weight, is irradiated with an UV lamp in order to generate a percentage of oxygen-centred free radicals higher than the percentage present in the non irradiated biocide before its use in the waters to be treated;

ii) continuously or periodically releasing the biocide obtained in step i) in the waters to be treated, and

iii) at least one step of monitoring said aquatic filtering organisms and/or larvae thereof in waters near said structures.

6. A method according to claim 5 wherein at least one step in said monitoring consists in :

a. monitoring the parameters identifying phytoplankton biomass values in waters near said surfaces;

b. determining from said values the time-pattern of the phytoplankton biomass and identifying a time instant at which said pattern exhibits a peak;

c. monitoring zooplankton in said time instant and assessing the presence or the absence of zooplankton-stage larvae of said filtering organisms near said surfaces and, in the case of presence of said larvae;

d. calculating as a function of said time instant a period of maximum density of said filtering organisms and, optionally, the periods of minimum density of said filtering organisms;

d') irradiating with UV so as to generate a percentage of oxygen-centred free radicals higher than that present in said non irradiated biocide before its use in waters to be treated, a biocide compound containing a peroxide-type bond, or a mixture of biocide compounds containing a peroxide-type bond, wherein said biocide or said mixture have a total concentration of at least 1% by weight, prior to its use in the waters to be treated;

e. subjecting said waters to one or more primary treatments with said biocide or said biocide mixture obtained in step d' during said period of maximum density, and, optionally,

f. subjecting said waters to one or more secondary treatments with said biocide or said biocide mixture obtained in step d' during said periods of minimum density;

g. carrying out further steps of monitoring the zooplankton in said waters.

7. The method according to claim 3 wherein said biocide obtained in step i) is used in the waters to be treated at final concentration of between 1 and 300 ppm.

8. The method according to claim 4 wherein said biocide obtained in step i) is

used in the waters to be treated at final concentration of between 1 and 300 ppm.

9. The method according to claim 5 wherein said biocide obtained in step i) is used in the waters to be treated at final concentration of between 1 and 300 ppm.

10. A plant for treating waters comprising:

a) means for the intake of waters to be treated;

b) at least one storage tank that contains one or more biocide containing a peroxide-type bond;

c) at least one irradiation chamber for said one o more biocide by means of UV rays comprising at least one UV lamp;

d) means for the intake of said one or more biocide irradiated with said UV lamp, and

e) means for the emission of treated waters

wherein c) is upstream of d) and e),

characterised in that said means for the intake of waters to be treated comprises a water collection tank and a tubing system so to provide a separate intake of said waters to be treated and said irradiated one or more biocide.

11. The plant according to claim 10, further comprising means for monitoring micro-organisms in waters to be treated and/or treated.

12. The plant according to claims 10 or 11, further comprising means for monitoring aquatic filtering organisms and/ or larvae thereof in waters near surfaces of submerged structures.

13. The plant according to claim 12, further comprising:

l. means for monitoring the parameters identifying phytoplankton biomass values in waters near said surfaces;

l. means for elaborating said values;

wherein said means for monitoring aquatic filtering organisms larvae are capable to perform a qualitative and quantitative monitoring of zooplankton.

Claims

1. A method for preparing an oxidant biocide enriched in oxygen-centred free radicals, wherein a biocide selected from peracetic acid, TAED, performic acid, perlauric acid, mono-perglutaric acid, or mixtures thereof having a total concentration of at least 1% by weight is irradiated with UV so to generate a percentage of oxygen-centred free radicals higher than the percentage present in the non irradiated biocide or mixtures thereof.

2. The method according to claim 1, wherein said total concentration is of at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 % by weight.

3. A method for sterilizing waters comprising the following steps:

i) at least one step wherein a biocide selected from peracetic acid, TAED, performic acid, perlauric acid, mono-perglutaric acid or mixtures thereof having a total concentration of at least 1% by weight, is irradiated with UV so to generate a percentage of oxygen-centred free radicals higher than the percentage present in the non irradiated biocide or mixtures thereof before its use in waters to be treated and

ii) at least one step wherein the biocide obtained in step i), is introduced in the waters to be treated.

4. A method for controlling the colonisation of micro-organisms in waters comprising the following steps:

i) at least one step wherein a biocide selected from peracetic acid, TAED, performic acid, perlauric acid, mono-perglutaric acid or mixtures thereof having a concentration of at least 1% by weight, is irradiated with UV so to generate a percentage of oxygen-centred free radicals higher than the percentage present in the non irradiated biocide or mixtures thereof before its use in waters to be treated and;

ii) at least one step wherein the biocide obtained in step i), is introduced in the waters to be treated; and

iii) at least one step of monitoring said micro-organisms in the waters to be treated and/or in the waters treated.

5. A method for controlling and/or preventing the colonisation by aquatic filtering organisms on the surfaces of submerged structures comprising the following steps:

i) at least one step wherein a biocide a biocide selected from peracetic acid, TAED, performic acid, perlauric acid, mono-perglutaric acid or mixtures thereof having a concentration of at least 1% by weight, is irradiated with an UV lamp in order to generate a percentage of oxygen-centred free radicals higher than the percentage present in the non irradiated biocide or mixtures thereof before its use in the waters to be treated;

ii) continuously or periodically releasing the biocide obtained in step i) in the waters to be treated, and

iii) at least one step of monitoring said aquatic filtering organisms and/or larvae thereof in waters near said structures.

6. A method according to claim wherein at least one step in said monitoring consists in :

a. monitoring the parameters identifying phytoplankton biomass values in waters near said surfaces;

b. determining from said values the time-pattern of the phytoplankton biomass and identifying a time instant at which said pattern exhibits a peak;

c. monitoring zooplankton in said time instant and assessing the presence or the absence of zooplankton-stage larvae of said filtering organisms near said surfaces and, in the case of presence of said larvae;

d. calculating as a function of said time instant a period of maximum density of said filtering organisms and, optionally, the periods of minimum density of said filtering organisms;

d') irradiating with UV so as to generate a percentage of oxygen-centred free radicals higher than that present in said non irradiated biocide before its use in waters to be treated, a biocide a biocide selected from peracetic acid, TAED, performic acid, perlauric acid, mono-perglutaric acid or mixtures thereof, wherein said biocide or said mixture have a total concentration of at least 1% by weight, prior to its use in the waters to be treated;

e. subjecting said waters to one or more primary treatments with said biocide or said biocide mixture obtained in step d' during said period of maximum density, and, optionally,

f. subjecting said waters to one or more secondary treatments with said biocide or said biocide mixture obtained in step d' during said periods of minimum density;

g. carrying out further steps of monitoring the zooplankton in said waters.

7. The method according to claims 3, 4 or 5 wherein said biocide obtained in step i) is used in the waters to be treated at final concentration of between 1 and 300 ppm.

8. The method according to claims 3-7 wherein said total concentration is of at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 % by weight.

9. A plant for treating waters comprising:

a) means for the intake of waters to be treated;

b) at least one storage tank that may contain one or more biocide containing a peroxide-type bond;

c) at least one irradiation chamber for said one o more biocide by means of UV rays comprising at least one UV lamp;

d) means for the intake of said one or more biocide irradiated with said UV lamp,

d') a tank for said waters to be treated, receiving said waters to be treated and said irradiated biocide from different intakes, and

e) means for the emission of treated waters

wherein c) is upstream of d) and e),

characterised in that said waters to be treated are not irradiated.

10. The plant according to claim 9, further comprising means for monitoring micro-organisms in waters to be treated and/or treated.

11. The plant according to claims 9 or 10, further comprising means for monitoring aquatic filtering organisms and/ or larvae thereof in waters near surfaces of submerged structures.