Claims

1. Method for remediation and/or restoration of a body of water comprising an anoxic body of water (10), wherein the anoxic body of water is an underlying water layer (10) lying below a surface water layer (12) and wherein a calcium nitrate solution (3) is added to the anoxic body of water (10), CHARACTERIZED IN THAT the method comprises the steps of

- mixing water having a percent of oxygen saturation of between 50% and 150%, preferably around 100%, with the calcium nitrate solution (3), resulting in a mixture, preferably having a concentration of calcium nitrate-N of between 10 and 1000 mg/l, depending on the volume of the anoxic body of water (10) and the water flow in the anoxic body of water (10), wherein the water is taken from the surface water layer (12), the underlying water layer (10) or a ground water source (13) in the vicinity of the surface water layer (12), and wherein the water is mixed with oxygen (4), preferably in the form of atmospheric air, oxygen enriched atmospheric air, or 100% pure oxygen,
- pumping the mixture into the body of water ,

until the final concentration of nitrate-N in the remedied and/or restored anoxic body of water (10) is between 1 to 20 mg/l.

2. Method according to claim 1, wherein the anoxic body of water being an underlying water layer is a hypolimnion (10) of a thermally stratified body of water (20).

3. Method according to claim 2, wherein the thermally stratified body of water (20) has an epilimnion (12), and the water that is mixed with the calcium nitrate solution (3) is water taken from the epilimnion (12).

4. Method according to claim 2, wherein the water that is mixed with the calcium nitrate solution (3) is water taken from the hypolimnion (10) which is mixed with oxygen (4) to a percent of oxygen saturation of between 50% and 150%.

5. Method according to claim 2, wherein the thermally stratified body of water (20) has an epilimnion (12), and wherein the water that is mixed with the calcium nitrate solution (3) is taken from ground water (13) in the vicinity of the thermally stratified body of water (20) and which is mixed with oxygen to a percent of oxygen saturation of between 50% and 150%.

6. Method according to claim 1, wherein the anoxic body of water being an underlying water layer is an anoxic body of water comprised in a sludge or sediment layer of said body of water.

7. Method according to claim 6, wherein the water that is mixed with the calcium nitrate solution (3) is taken from the anoxic body of water comprised in the sludge or sediment layer and which is mixed with oxygen to a percent of oxygen saturation of between 50% and 150%.

8. Method according to any one of the preceding claims, wherein the method comprises the step of controlling and optimizing the amount of calcium nitrate solution that has to be added to the anoxic body of water (10) and the time when and for how long the calcium nitrate solution has to be added to the anoxic body of water (10).

9. Method according to any one of the preceding claims, wherein the calcium nitrate solution comprises one or more substances for enhancing precipitation of phosphorus.

10. System (1) for remediation and/or restoration of a flat body of water or the bottom part of a thermally stratified body of water comprising an anoxic body of water (10) arranged to perform a method according to any one of claims 1 to 9, wherein the system (1) is provided with means to add a calcium nitrate solution (3) to the anoxic body of water (10), CHARACTERIZED IN THAT the means to add the calcium nitrate solution (3) to the anoxic body of water (10) comprises a mixing device (2) arranged to mix the calcium nitrate solution (3) with water having a percent of oxygen saturation of between 50% and 150%, resulting in a mixture, wherein the system (1) comprises first pumping means (5) for pumping the mixture into the body of water and optionally second pumping means (6) for pumping the water that is to be mixed with the calcium nitrate solution (3) towards the mixing device (2), and wherein the system (1) comprises an oxygen mixing means forming part of the mixing device (2), for mixing oxygen (4) into the water, preferably ground water (13) or an underlying water layer (10), to obtain the water having a percent of oxygen saturation of between 50% and 150%.

11. System according to claim 10, wherein the anoxic body of water is an underlying water layer (10) lying beneath a surface water layer (12), and wherein the second pumping means (6) are configured for pumping either water from the surface layer water (12), ground

water out of a ground water source (13) that is situated in the vicinity of the surface water layer (12) or water from the underlying water layer (10) towards the mixing device (2).

12. System according to claim 11, wherein the anoxic body of water being an underlying water layer of a body of water is the hypolimnion (10) of a thermally stratified body of water (20), the thermally stratified body of water comprising an epilimnion (12), and wherein the second pumping means (6) are configured for pumping water from the epilimnion (12) towards the mixing device (2).

13. System according to claim 11, wherein the anoxic body of water being an underlying water layer of a body of water is the hypolimnion (10) of a thermally stratified body of water (20), the thermally stratified body of water (20) comprising an epilimnion (12), and wherein the second pumping means (6) are configured for pumping up ground water (13) that is situated in the vicinity of the thermally stratified body of water (20) towards the mixing device (2), wherein the system (1) comprises oxygen mixing means for mixing oxygen (4) into the ground water (13), said oxygen mixing means preferably forming part of the mixing device (2).

14. System according to claim 11, wherein the anoxic body of water being an underwater layer of a body of water is the hypolimnion (10) of a thermally stratified body of water (20), and wherein the second pumping means (6) are configured for pumping up water from the hypolimnion (10) towards the mixing device (2), wherein the system (1) comprises oxygen mixing means for mixing oxygen (4) into the hypolimnion (10), said oxygen mixing means preferably forming part of the mixing device (2).

15. System according to claim 11, wherein the anoxic body of water, being an underwater layer of a body of water, is a body of water comprised in a sludge or sediment layer of said body of water, and wherein the second pumping (6) means are configured for pumping the water separated from the sludge layer towards the mixing device (2), and wherein the system (1) comprises mixing means for mixing oxygen (4) into the water separated from the sludge or sediment layer, said oxygen mixing means preferably forming part of the mixing device (2).

16. System according to any one of claims 10 to 15, wherein the mixing device (2) forms part of an onshore station.

17. Use of a calcium nitrate solution mixed with water having a percent of oxygen saturation of between 50% and 150%, preferably around 100%, for prevention of a reducing environment having a negative redox potential and with anoxic biological processes in an anoxic body of water, wherein the water having a percent of oxygen saturation of between 50% and 150% is taken from the surface water layer, the underlying water layer or a ground water source in the vicinity of the surface water layer and is mixed with oxygen via an oxygen mixing means.

18. Use according to claim 17, wherein the anoxic body of water is the hypolimnion of a thermally stratified body of water, or is the body of water comprised in the sludge layer of a body of water.

19. Use of a calcium nitrate solution mixed with water having a percent of oxygen saturation of between 50% and 150%, preferably around 100%, for the binding and prevention of release and remobilization of nutrients, particularly phosphor out of an anoxic body of water, wherein the water having a percent of oxygen saturation of between 50% and 150% is taken from the surface water layer, the underlying water layer or a ground water source in the vicinity of the surface water layer and is mixed with oxygen via an oxygen mixing means.

20. Use according to claim 19, wherein the anoxic body of water is the hypolimnion of a thermally stratified body of water, or is the body of water comprised in the sludge layer of a body of water.