CLAIMS

1. A filter suitable for purifying sewage water from one or more environmentally hazardous organic substances, such as drug molecules, comprising a H_2O stable open-cell foam material, and one or more enzymes covalently bound to said material, wherein said enzymes have the ability to eliminate said environmentally hazardous substances, and wherein the filter is suitable to be placed in a module system within a sewage water treatment system, such that water will flow through one or more filters, whereby the water is brought into contact with said one or more enzymes and said enzymes will eliminate any one or more environmentally hazardous organic substances present in said water, characterized in that the one or more enzymes are chosen from the group comprising of Lignin Peroxidase, Epoxide hydrolase, P450 BM3, Melamine Deaminase, Acetoacetate decarboxylase, Dehalogenase and LinB, and wherein said enzyme(s) are modified to eliminate environmentally hazardous organic substances at a pH of 5.5 – 8.5 and a temperature of +8°C – 20°C.

2. The filter according to claim 1, wherein the H_2O stable open-cell foam material is chosen from the group consisting of polyvinyl alcohol, cellulose based material, polyethylene imine and polyester/polyurethane.

3. The filter according to any of claims 1 or 2, wherein the filter comprises polyvinyl alcohol.

4. The filter according to any of claims 1 or 2, wherein the cellulose based material is a cellulose foam, and/or cotton-cellulose.

5. Use of a filter according to any of claims 1-4, wherein water flowing through the filter will come in contact with the one or more enzymes presented on the surface of the material of

the filter, such that the enzymes may eliminate any environmentally hazardous organic substances, such as drug molecules, present in said water.

6. A module system (10) comprising an inlet (1), at least one filter chamber (2), an outlet (3), a first valve (4) connected to each filter chamber upstream thereof for regulating the flow of water from the inlet to the filter chamber, and a second valve (5) connected to each filter chamber downstream thereof for regulating the flow of water from the filter chamber to the outlet, each filter chamber (2) comprising a top portion (6), a bottom potion (7), a wall surface (8; 8a; 8b; 8c), and a hatch (9), wherein the module system is connected to a water treatment system such that water to be treated is led to the inlet (1), allowing said water to flow through the inlet (1) to the at least one filter chamber (2), and thereafter flow through to the outlet (3) of the module system, wherein each said at least one filter chamber (2) comprises a filter according to any of the claims 1-4.

7. A module system according to claim 6, additionally comprising an overflow channel (11) comprising a bursting disc, and/or a flow meter.

8. Use of a module system according to any of the claims 6-7, for purification of sewage water from any environmentally hazardous organic substances, such as drug molecules, plasticizers, flame retardants, herbicides, pesticides, fungicides, cosmetics, fabrics additives, etc., within a water treatment plant or water treatment system.

9. A method of purifying sewage water from one or more environmentally hazardous organic substances, comprising the steps of:

a) providing one or more polynucleotide(s) encoding one or more enzymes having the capacity to eliminate an environmentally hazardous organic substance;

b) producing the enzymes recombinantly in an organism transformed with a vector, such as a plasmid, comprising the polynucleotide from a), wherein the enzyme is produced by said organism, thereby obtaining an enzyme solution;

c) adding the enzyme solution to a filter, wherein the filter comprises a material having the capacity to bind the enzyme(s), wherein the enzyme(s) bind(s) covalently to said material, which filter is to be put in contact with water to be purified from the environmentally hazardous organic substances;

d) using the filter in a sewage water treatment system wherein water is to be purified from one or more environmentally hazardous organic substances, such that the filter enzymatically reduces and/or eliminates the one or more environmentally hazardous organic substances from the water,

characterized in that the one or more enzymes are chosen from the group comprising of Lignin Peroxidase, Epoxide hydrolase, P450 BM3, Melamine Deaminase, Acetoacetate decarboxylase, Dehalogenase and LinB, and wherein said enzyme(s) are modified to eliminate environmentally hazardous organic substances at a pH of 5.5 – 8.5 and a temperature of +8^{o}C – 20^{o}C.

10. The method according to claim 9, wherein the vector in step b) comprises a signal peptide coupled to the polynucleotide encoding the enzyme, and wherein the signal peptide directs an extracellular transport of the produced enzyme.

11. The method according to claim 9 or claim 10, wherein the enzyme is recombinantly produced by an organism capable of extracellular production of the enzyme, so that the enzyme is transported by the organism to a supernatant in a culture of said organism, such as E. coli, Bacillus species or yeast.

12. The method according to any of claims 9-11, wherein the enzyme solution obtained in step b) is a culture supernatant comprising the produced enzyme, which is directly added to the filter in step c) in order to covalently bind the enzymes in the filter.

13. The method according to any of claims 9-12, wherein the material of the filter is a H_2O stable open-cell foam material.

14. The method according to any of claims 9-13, wherein in step c) the filter comprises a material chosen from the group comprising polyvinyl alcohol, cellulose based material, polyethylene imine and polyester/polyurethane, preferably polyvinyl alcohol.

15. The method according to any of claims 9-14, wherein the cellulose based material is cotton-cellulose or cellulose foam.