CLAIMS

1. A process of forming an inorganic water barrier layer on top of a porous substrate in need thereof, the process comprising the steps of:

(a) providing a porous substrate having a top surface;

(b) depositing a urease-active slurry onto the top surface of the porous substrate to form a bioslurry layer, the urease-active slurry comprising an aqueous suspension of particles of a water-insoluble inorganic material that is impregnated with urease-active bacteria, where the formed bioslurry layer includes the particles of the water-insoluble inorganic material; and

(c) subjecting the bioslurry layer to one or more treatments with an aqueous solution comprising urea and a water barrier source material to convert the bioslurry layer into an inorganic water barrier layer;

wherein the resulting inorganic water barrier layer has a water permeability in the order of from 10^{-10} to 10^{-5} m/s.

2. The process according to Claim 1, wherein the process further comprises a step of covering the bioslurry layer of step (b) with a layer of a porous material that has a surface, where the one or more treatments of step (c) are initially applied to the surface of the porous material.

3. The process according to Claim 1, wherein the urease-active slurry has a solid content of from 5 to 80% w/w.

4. The process according to claim 1, wherein the porous substrate is selected from one or more of the group consisting of a cracked inorganic water barrier layer, sand, soil, and rocks.

5. The process according to claim 1, wherein the water-insoluble inorganic material is a metal carbonate.

6. The process according to Claim 5, wherein the metal of the metal carbonate is selected from one or more of the group consisting of Ca, Mg, and Al.

7. The process according to Claim 5, wherein the metal carbonate is $CaCO_3$.

8. The process according to claim 1, wherein the water barrier source material is selected from one or more of the group consisting of a metal chloride, a metal acetate, a metal lactate, and a metal nitrate.

9. The process according to Claim 8, wherein the metal in the water barrier source material is selected from one or more of the group consisting of Ca, Mg, and Al.

10. The process according to Claim 9, wherein the metal is calcium.

11. The process according to claim 1, wherein the aqueous solution comprises a molar ratio of urea:water barrier source material of from 1:20 to 20:1.

12. The process according to claim 1, wherein each of the urea and the water barrier source material independently have a concentration of from 0.1 to 2 mol/L.

13. The process according to Claim 12, wherein there is an equimolar concentration of urea and water barrier source material in the aqueous solution.

14. The process according to claim 1, wherein the bioslurry layer and the inorganic water barrier layer independently have a thickness of from 0.5 to 25 mm.

15. The process according to claim 1, wherein the urease activity of the urease-active slurry is from 10 to 1500 U/g.

16. The process according to claim 1, wherein the bioslurry layer formed in step (b) has a water permeability in the order of 10^{-5} m/s.

17. The process according to claim 1, wherein the modulus of rupture of the inorganic water barrier layer is 2 to 10 MPa when measured using a sample of the layer that is 0.1 mm thick and has a length of from 6 to 10 cm and a width of from 3 to 5 cm.

18. The process according to claim 2, wherein the porous material is selected from one or more of the group consisting of sand, soil and rocks.

19. The process according to claim 2, wherein the resulting inorganic water barrier layer has a water permeability in the order of from 10^{-10} to 10^{-6} m/s.

20. The process according to claim 2, wherein the porous material layer has a thickness of greater than 1.5 cm.

21. The process according to claim 2, wherein when there are two or more treatments with an aqueous solution comprising urea and a water barrier source material in step (c) of Claim 1, each treatment is separated by a period of time of from 1 hour to 72 hours.