What is claimed is:

1. A sintered clay mineral matrix, wherein the matrix is porous, contains aluminum, and is doped with 0.1-20 mol%, based on the amount of the aluminum, one or more transition metals, one or more post-transition metals, one or more rare earth metals, or a combination thereof, in which at least zinc or lanthanum is a dopant.

2. The sintered clay mineral matrix of claim 1, wherein the transition metal is titanium, chromium, iron, cobalt, manganese or yttrium, the post-transition metal is zinc, and the rare earth metal is lanthanum.

3. The sintered clay mineral matrix of claim 2, wherein the matrix is a membrane.

4. The sintered clay mineral matrix of claim 3, wherein the matrix is doped with lanthanum or zinc.

5. The sintered clay mineral matrix of claim 4, wherein the matrix is doped with lanthanum 5-15 mol%.

6. The sintered clay mineral matrix of claim 4, wherein the sintered clay mineral matrix is a sintered kaolinite matrix.

7. The sintered clay mineral matrix of claim 6, wherein the matrix is doped with lanthanum and the pores in the matrix have two distinctive diameter distributions, one in a range of 4 to 11 μm and the other less than 3 μm.

8. The sintered clay mineral matrix of claim 6, wherein the matrix is doped with lanthanum and has a mechanical strength rate of greater than 5 MPa and a Darcy's permeability rate of greater than 5.00E-014 m^2.

9. The sintered clay mineral matrix of claim 4, wherein the matrix is doped with zinc 5-20 mol%.

10. The sintered clay mineral matrix of claim 6, wherein the matrix is doped with zinc and has a mechanical strength rate of greater than 30 MPa.

11. A calcined clay mineral powder, wherein the powder contains aluminum and is doped with 0.1-20 mol%, based on the amount of the aluminum, one or more transition metals, one or more post-transition metals, one or more rare earth metals, or a combination thereof, in which at least zinc or lanthanum is a dopant.

12. The calcined clay mineral powder of claim 11, wherein the transition metal is titanium, chromium, iron, cobalt, manganese or yttrium, the post-transition metal is zinc, and the rare earth metal is lanthanum.

13. The calcined clay mineral powder of claim 12, wherein the powder is doped with lanthanum or zinc.

14. The calcined clay mineral powder of claim 13, wherein the powder is doped with lanthanum 5-15 mol%.

15. The calcined clay mineral powder of claim 13, wherein the powder is doped with zinc 5-20 mol%.

16. The calcined clay mineral powder of claim 13, wherein the calcined clay mineral powder is a calcined kaolinite powder.

17. A method of preparing a clay mineral material, the method comprising:

dissolving one or more salts of transition metals, one or more salts of post-transition metals, one or more salts of rare earth metals, or a combination thereof in water to form a solution;

adding an organic solvent to the solution to form a second solution;

mixing clay mineral with the second solution to form a homogenous mixture;

heating the homogenous mixture at 50-150 °C for 12-72 hours to obtain a dried lump;

calcining the dried lump at 500-800 °C for 1-10 hours, and then cooling it to an ambient temperature, wherein both the heating and cooling are each conducted at a rate of 1-20 °C/min; and

grinding the calcined lump to obtain a metal-doped clay mineral powder.

18. The method of claim 17, wherein the transition metal is titanium, chromium, iron, cobalt, manganese or yttrium, the post-transition metal is zinc, and the rare earth metal is lanthanum.

19. The method of claim 18, wherein the clay mineral is kaolinite.

20. The method of claim 18, wherein the salt is lanthanum nitrate or zinc nitrate.

21. The method of claim 17, further comprising:

mixing the metal-doped clay mineral powder with a solution to form a second homogenous mixture, wherein the solution is prepared by dissolving 1-10 wt% polymeric binder in a pure or mixed organic solvent and includes 0.1 to 1 wt% additives that is a non-ionic surfactant, a deflocculating agent, and a plasticizer;

drying the second homogenous mixture at an ambient temperature for 1-10 hours to form a cake;

grinding the cake to obtain a powder;

molding the powder to form a ceramic green body by forming techniques of compression molding, extrusion, slip casting or tape casting; and

sintering the green body at 1000-1400 °C for 2-10 hours, and then cooling it to an ambient temperature, wherein both the heating and cooling are each

conducted at a rate of 1-20 °C/min, to obtain a metal-doped clay mineral matrix.

22. The method of claim 21, wherein the clay mineral is kaolinite.