CLAIMS:

1. A porous liquid or a porous liquid enzyme comprising:

a high surface area solid having a surface area of greater than 0.001 m^2/g and an S/V of greater than 180 m^{-1}, wherein S is the surface area of the high surface area solid and V is the volume of the high surface area solid; and

wherein the high surface area solid includes wool, glass, glass wool, polyethylene wool, quartz wool, fibers, or a combination thereof; and

a liquid film coating at least 30% of the surface area of the high surface area solid.

2. The porous liquid of claim 1, wherein the high surface area solid ~~includes at least one of:~~ further comprises

a rough surface, a textured surface, or both.~~;~~

~~a sum of the apparent surface area of the solid of greater than 0.001 m^2/g; or combinations thereof.~~

3. The porous liquid of claim 1, wherein the high surface area solid comprises a matrix of solid features spaced sufficiently close to stably contain a liquid therebetween such that the solid features have an average dimension of ~~about~~ 0.1 µm to 1000 µm and/or an average distance between them of ~~about~~ 0.1 µm to 500 µm.

~~4. The porous liquid of claim 1, wherein the high surface area solid includes wool, glass, glass wool, polyethylene, insoluble fibers, polyethylene wool, quartz, quartz wool, fibers, polymer fibers, a 3D printed structure, or a combination thereof.~~

~~5.~~4. The porous liquid of claim 1, wherein the high surface area solid is made of a material that is not reactive with the liquid film.

~~6.~~5. The porous liquid of claim 1, further comprising a working fluid ~~in contact with the liquid film, wherein the fluid is immiscible with the liquid film such that~~ forming a liquid-fluid interface ~~is formed~~ with the liquid film.

~~7.~~6. The porous liquid of claim 1, further comprising an S/V of greater than ~~180 m^{-1}~~ 500 m^{-1}, wherein S is the surface area of the high surface area solid and V is the volume of the high surface area solid.

~~8.~~7. The porous liquid of claim 1, further comprising a fluid in contact with the liquid film and a performance index, PI, of at least 150 m^{-1}.

~~9.~~8. The porous liquid of claim ~~6~~ 5, wherein the liquid film facilitates mass transfer of at least one substance or substrate across the liquid-fluid interface.

~~10.~~9. The porous liquid of 1, wherein the liquid film includes at least one of:

an amine;

~~monoethanolamine;~~

~~tetraethylenepentamine;~~

an alkali metal hydroxide;

~~potassium hydroxide;~~

~~sodium hydroxide;~~

~~lithium hydroxide;~~

glycol;

~~triethylene glycol;~~

an enzyme;

a thickness from the bottom of the roughness or the texture to the top surface of the liquid film no greater than 1400 µm; or

a combination thereof.

~~11.~~10. A method of performing a liquid-based extraction, the method comprising:

contacting (1) a porous liquid comprising a high surface area solid and a liquid film, wherein the high surface solid has a surface area of greater than 0.001 m^2/g, and wherein the high surface area solid includes wool, glass, glass wool, polyethylene wool, quartz wool, fibers, or a combination thereof; such that:

i) the liquid film coats at least 30% of the surface area of the high surface area solid,

ii) the porous liquid has an S/V greater than 180 m^{-1} wherein S is the surface area of the high surface area solid and V is the volume of the high surface area solid, and

iii) the performance index (PI) is at least 150 m^{-1}; and

(2) a fluid that is immiscible with the liquid film such that a liquid-fluid interface is produced, wherein at least one substance in the fluid is extracted by the liquid film resulting in mass transfer across the liquid-fluid interface.

~~12.~~11. The method of claim ~~11~~ 10, wherein the liquid film has a contact angle on the high surface area solid in the presence of the fluid that is less than about 15 degrees.

~~13.~~12. The method of claim ~~11~~ 10, wherein the fluid is a gas.

~~14.~~13. The method of claim ~~13~~ 12, wherein at least one of:

the fluid includes carbon dioxide;

the liquid film includes an amine, potassium hydroxide, or both; or

a combination thereof.

~~15.~~14. The method of claim 10 or 11~~ or 12~~, wherein at least one of:

the fluid includes water;

the liquid film includes glycol; or

combinations thereof.

~~16.~~15. The method of claim 10 or 11~~ or 12~~, wherein the fluid is a liquid.

~~17.~~16. The method of claim 10 or 11~~ or 12~~, wherein at least one of: the fluid includes furfural~~,~~ or the liquid film includes toluene~~, the high surface area solid comprises polyethylene, or combinations thereof~~.

~~18.~~17. The method of claim ~~11~~ 10, wherein the porous liquid is the porous liquid of claim 1.

~~19.~~18. A method of performing an enzymatic reaction, the method comprising:

contacting (1) a porous liquid enzyme comprising a high surface area solid and a liquid film comprising an enzyme, wherein the high surface solid has a surface area of greater than 0.001 m^2/g, and wherein the high surface area solid includes wool, glass, glass wool, polyethylene wool, quartz wool, fibers, or a combination thereof, such that

i) the liquid film coats at least 30% of the surface area of the high surface area solid,

ii) the porous liquid enzyme has an S/V of greater than 180 m^{-1} wherein S is the surface area of the high surface area solid and V is the volume of the high surface area solid, and

iii) the performance index (PI) is at least 150 m^{-1}; and

(2) a fluid comprising at least one substrate for the enzyme in the liquid film, wherein the fluid is immiscible with the liquid film such that a liquid-fluid interface is produced, and wherein contacting the fluid and the porous liquid enzyme results in at least one of the catalysis of the substrate, mass transfer of the substrate across the liquid-fluid interface, or both.

~~20.~~19. The method of claim ~~19~~ 18, wherein the liquid film has a contact angle on the high surface area solid in the presence of the fluid that is less than about 15 degrees.

~~21.~~20. The method of claim ~~19~~ 18, wherein the liquid film is an aqueous solution and the fluid is an organic solution.

~~22.~~21. The method of claim ~~19~~ 18, wherein the enzyme comprises cytochrome c, the substrate comprises nickel octaethylporphyrin, and the high surface area solid comprises wool.