CLAIMS

WHAT IS CLAIMED IS:

1. A method of purifying isoprene from a fermentor off-gas comprising:

contacting a fermentor off-gas comprising isoprene, volatile impurity, and bio-byproduct impurity, with a solvent in a first column to form:

an isoprene-rich solution comprising the solvent, a major portion of the isoprene and a major portion of the bio-byproduct impurity present in the off-gas; and

a vapor comprising a portion of the volatile impurity present in the off-gas;

transferring the isoprene-rich solution from the first column to a second column; and

stripping isoprene from the isoprene-rich solution in the second column to form:

an isoprene-lean solution comprising a portion of the bio-byproduct impurity present in the off-gas; and

a purified isoprene composition.

2. The method of Claim 1, wherein the bio-byproduct impurity comprises a polar impurity.

3. The method of Claim 1, wherein in the off-gas the amount of bio-byproduct impurity relative to the amount of isoprene is greater than ~~about~~ 0.01 % (w/w).

4. The method of Claim 1, wherein the solvent has a Kauri-butanol value of less than ~~about~~ 50.

5. The method of Claim 1, wherein the solvent has an Aniline Point of greater than ~~about~~ 66 °C.

6. The method of Claim 1, wherein the solvent has a kinematic viscosity at 40 °C is less than ~~about~~ 2.5 centistokes (cSt).

7. The method of Claim 1, wherein the solvent has a surface tension at 25 °C from ~~about~~ 20 to 30 dyne/cm.

8. The method of Claim 1, wherein the solvent has an average molecular weight from ~~about~~ 125 to ~~about~~ 225.

9. The method Claim 1, wherein the solvent further comprises a polymerization inhibitor.

10. The method of Claim 1, wherein the contacting the fermentor off-gas with a solvent in a first column comprises supplying stripping vapor from a bottom of the first column.

11. The method of Claim 1, wherein the contacting the fermentor off-gas with a solvent in a first column further comprises adding steam to the first column.

12. The method of Claim 1, wherein the stripping isoprene from the isoprene-rich solution in the second column comprises adding steam to the second column.

13. The method of Claim 1, further comprising:

purifying the isoprene-lean solution to remove a major portion of the bio-byproduct impurity; and

transferring the isoprene-lean solution to the first column for reuse.

14. The method of Claim 13, wherein purifying the isoprene-lean solution comprises treating the isoprene-lean solution with an adsorption system.

15. The method of Claim 13, wherein purifying the isoprene-lean solution comprises distillation.

16. The method of Claim 13, wherein purifying the isoprene-lean solution comprises liquid-liquid extraction.

17. The method of Claim 1, comprising further purifying the purified isoprene composition by distillation or adsorption.

18. The method of Claim 1, further comprising removing from the vapor a portion of the isoprene.

19. The method of Claim 1, wherein the fermentor off-gas is provided to the first column at a pressure greater than atmospheric.

20. A purified isoprene composition prepared by the method of Claim 1.

21. The method of Claim 17, wherein the further purifying comprises contacting the purified isoprene composition with water or a base and water.

22. A composition comprising isoprene and bio-byproduct impurity, wherein the bio-byproduct impurity comprises C5 hydrocarbons, and wherein there is greater than about 99.94% isoprene (w/w) relative to the weight of the C5 hydrocarbons, and less than about 0.05% bio-byproduct (w/w) relative to the weight of the isoprene.

23. The composition of Claim 22, wherein the bio-byproduct impurity comprises one or more compounds selected from the group consisting of: 2-heptanone, 6-methyl-5-hepten-2-one, 2,4,5-trimethylpyridine, 2,3,5-trimethylpyrazine, citronellal, acetaldehyde, methanethiol, methyl acetate, 1-propanol, diacetyl, 2-butanone, 2-methyl-3-buten-2-ol, ethyl acetate, 2-methyl-1-propanol, 3-methyl-1-butanal, 3-methyl-2-butanone, 1-butanol, 2-pentanone, 3-methyl-1-butanol, ethyl isobutyrate, 3-methyl-2-butenal, butyl acetate, 3-methylbutyl acetate, 3-methyl-3-but-1-enyl acetate, 3-methyl-2-but-1-enyl acetate, (E)-3,7-dimethyl-1,3,6-octatriene, (Z)-3,7-dimethyl-1,3,6-octatriene, (E,E)-3,7,11-trimethyl-1,3,6,10-dodecatetraene and (E)-7,11-dimethyl-3-methylene-1,6,10-dodecatriene.

24. The composition of Claim 22, further comprising less than ~~about~~ 5% volatile impurity relative to the weight of the composition.

25. A composition which is an isoprene-rich solution, comprising:
a solvent;
isoprene; and
a bio-byproduct impurity being a lesser portion of the solution than is the isoprene.