CLAIMS

What is claimed is:

1. A process for producing butadiene monomer, the process comprising:

(a) providing used tire feedstock;

(b) gasifying the used tire feedstock to produce a gaseous stream, where the gaseous stream includes carbon monoxide, hydrogen, and carbon dioxide;

(c) biosynthetically converting at least a portion of the carbon monoxide, hydrogen, and carbon dioxide within the gaseous stream to produce a first product stream, where the first product stream includes ethanol;

(d) converting at least a portion of the first product stream to a second product stream, where the second product stream includes acetaldehyde and hydrogen;

(e) routing a portion of the hydrogen within the second product stream to said step of biosynthetically converting at least a portion of the carbon monoxide, hydrogen, and carbon dioxide within the gaseous stream; and

(f) converting at least a portion acetaldehyde to butadiene monomer.

2. The process of claim 1, further comprising the steps of polymerizing the butadiene monomer to polybutadiene or a polybutadiene copolymer, and fabricating a tire component with the polybutadiene or polybutadiene copolymer.

3. The process of claim 1, where said step of gasifying includes gasifying used tire feedstock and a co-feed that includes carbonaceous material other than used tire feedstock.

4. A process for producing butadiene, the process comprising:

(a) providing used tire feedstock;

(b) optionally providing a co-feed that includes carbonaceous material other than used tire feedstock;

(c) gasifying the used tire feedstock and optional co-feed to produce a gaseous stream, where the gaseous stream includes carbon monoxide, hydrogen, and carbon dioxide;

(d) introducing the gaseous stream to an aqueous medium wherein the carbon monoxide, hydrogen, and carbon dioxide are converted to a first product stream, where the first product stream includes ethanol;

(e) converting the first product stream to a second product stream, where the second product stream includes acetaldehyde and hydrogen;

(f) separating the hydrogen from the second product stream to thereby form a hydrogen stream, which is introduced into the aqueous medium; and

(g) converting the acetaldehyde to a final product stream, where the final product stream includes butadiene.

5. The process of claim 4, where the ethanol is converted to the second product stream.

6. The process of claim 4, where said step of introducing the gaseous stream to the aqueous medium takes place within a bioreactor that contains one or more microorganisms for converting the carbon monoxide, hydrogen, and carbon dioxide to the first product stream.

7. The process of claim 4, comprising the step of introducing a second hydrogen stream to the aqueous medium.

8. The process of claim 4, where the step of converting the ethanol to a second product stream takes place within an acetaldehyde reactor, and further comprising the step of introducing a second stream of ethanol from external sources to the acetaldehyde reactor.

9. The process of claim 4, further comprising converting the butadiene to a polybutadiene or butadiene copolymer.

10. The process of claim 9, further comprising producing a tire material from the polybutadiene or butadiene copolymer.

11. The process of claim 4, where said step of gasifying includes gasifying the tire feedstock and co-feed.

12. The process of claim 4, where the co-feed includes biomass.

13. The process of claim 12, where the biomass includes bagasse.

14. A tire component prepared from a vulcanizable composition comprising the polybutadiene or butadiene copolymer of claim 9.

15. The tire component of claim 14, where the tire includes greater than 40 wt % sustainable material.

16. The tire component of claim 15, where the vulcanizable composition includes a filler, an oil, and a curative.

17. The tire component of claim 16, where the filler includes silica derived from rice husk ash.

18. The tire component of claim 16, where the oil includes a bio-oil or a plant-based oil.

19. A vulcanizable composition of matter comprising the polybutadiene or butadiene copolymer prepared by the process of claim 9.

20. The vulcanizable composition of claim 19, where the vulcanizable composition includes from about 30 to about 65 wt %, based on the total weight of the vulcanizable composition, of rubber, and where greater than 10 wt % of the rubber is the polybutadiene or polybutadiene copolymer prepared by any of the preceding claims.