WHAT IS CLAIMED IS:

1. A method of making a product comprising a carboxylic acid, a salt of a carboxylic acid, or an ester of a carboxylic acid, the method comprising:

treating biomass ~~with one or both of radiation and sonication~~ to reduce recalcitrance of the biomass; ~~and~~

converting, utilizing an added microorganism, ~~at least~~ a portion of the treated biomass to the product ~~comprising an ester~~, wherein the microorganism metabolizes both sugar and syngas feedstocks; and

thermochemically converting a second portion of the treated biomass to a syngas feedstock, and providing a portion of the syngas feedstock to the microorganism during converting.

~~2. The method of claim 1, wherein during converting a syngas is delivered to the microorganism.~~

~~3. The method of claim 2, wherein the syngas is selected from the group consisting of methanol, hydrogen, carbon monoxide, carbon dioxide and mixtures thereof.~~

~~4. The method of claim 2, wherein the syngas is produced by gasifying coal and/or a biomass.~~

~~5. The method of claim 1 or claim 2, wherein the method further comprises hydrogenating the product or exposing the product to one or other reducing agents, such as carbon monoxide.~~

~~6. The method of claim 5, wherein hydrogenating the product comprises exposing the product to hydrogen under a pressure of greater than about 25 bar in the presence of a catalyst.~~

~~7. The method of claim 6, wherein the hydrogen is produced from syngas produced by gasifying coal and/or biomass.~~

~~8. The method of any one of claims 1-7, wherein the converting comprises contacting the treated biomass with an enzyme.~~

~~9~~2. A method of making an alcohol, the method comprising:

treating biomass ~~with one or both of radiation and sonication~~ to reduce recalcitrance of the biomass;

converting, utilizing an added microorganism, ~~at least~~ a portion of the treated biomass to a product comprising a carboxylic acid, a salt of a carboxylic acid, or an ester of a carboxylic acid, wherein the microorganism metabolizes both sugar and syngas feedstocks;

thermochemically converting a second portion of the treated biomass to a syngas feedstock, and providing a portion of the syngas feedstock to the microorganism during converting; and

hydrogenating the product to produce an alcohol.

~~103~~. The method of claim 1 or claim 2 further comprising capturing any carbon dioxide generated and/or any lignin liberated.

~~114~~. The method of claim ~~103~~, wherein carbon dioxide is captured and the method further comprises sequestering the captured carbon dioxide.

~~125~~. The method of claim ~~114~~, wherein sequestering carbon dioxide comprises injecting captured carbon dioxide into a geological formation capable of maintaining carbon dioxide in place.

~~136~~. The method of claim ~~114~~, wherein sequestering carbon dioxide comprises fixing carbon dioxide utilizing a microorganism.

~~147~~. The method of claim ~~136~~, wherein the microorganism fixes the carbon dioxide in the form of a carbohydrate and/or a lipid.

~~158~~. The method of claim ~~147~~, wherein the microorganism fixes the carbon dioxide in the form of a lipid, the method further comprises converting the lipid to an ester.

9. The method of claim 1 or claim 2, wherein treating the biomass comprises physical preparation, sonication, pyrolysis, oxidation, steam explosion or a combination of any of the foregoing.

10. The method of claim 1 or claim 2, wherein treating the biomass is by radiation.

11. The method of claim 10, wherein the radiation comprises gamma radiation, microwave radiation, electron beam radiation, ion particle beam radiation, X-rays or a combination of any of the foregoing.

12. The method of claim 1 or claim 2 wherein the microorganism is bacterial.

13. The method of claim 1 or claim 2 wherein the microorganism is a yeast.

14. The method of claim 1 or claim 2 wherein the microorganism is a recombinant microorganism.

15. The method of claim 1 or claim 2, further comprising, preceding step b), contacting the treated biomass with one or more enzymes that degrade cellulose.

16. The method of claim 1 or claim 2, further comprising, during step b), contacting the treated biomass with one or more enzymes that degrade cellulose.