CLAMS

Claim 1. A biological and chemical method for the capture and conversion of carbon dioxide into organic compounds, comprising:

introducing carbon dioxide gas, either alone and/or dissolved in a mixture or solution further comprising carbonate ion and/or bicarbonate ion, into an environment suitable for maintaining chemoautotrophic organisms and/or chemoautotrophic cell extracts; and fixing the carbon dioxide and/or inorganic carbon into organic compounds within the environment via at least one chemosynthetic carbon fixing reaction utilizing chemoautotrophic microorganisms comprising a *Ralstonia sp.*;

wherein where the chemosynthetic carbon fixing reaction is driven by chemical and/or electrochemical energy provided by electron donors and electron acceptors that have been generated chemically and/or electrochemically and/or are introduced into the environment from at least one source external to the environment, and wherein the electron donor comprises hydrogen generated through an electrolysis method selected from the group comprising photon exchange membrane electrolysis, liquid electrolyte electrolysis, high pressure electrolysis, and high pressure electrolysis of steam and said electron acceptors, comprises carbon dioxide and/or oxygen;

wherein the environment suitable for maintaining chemoautotrophic organisms and/or chemoautotroph cell extracts is maintained using continuous influx and removal of nutrient medium and/or biomass, in substantially steady state where the cell population and environmental parameters are targeted at a substantially constant suitable or optimal level over time; and

wherein biomass is produced by the at least one chemosynthetic reaction, and wherein the biomass is separated from the environment and is processed into a product comprising an animal feed, a fertilizer, a soil additive, a soil stabilizer, a carbon source for large scale fermentations, a nutrient source for the growth of other microbes or organisms; and/or as a source of pharmaceutical, medicinal or nutritional substances.

Claim 2. A method according to claim 1, wherein the fixing step is followed by one or more process steps in which organic and/or inorganic chemical products of chemosynthesis are

separated from a process stream produced during the fixing step and processed to form products in a form suitable for storage, shipping, and sale.

Claim 3. A method according to any preceding claim, wherein said electron donors and/or electron acceptors are generated or recycled using renewable, alternative, or conventional sources of power that are low in greenhouse gas emissions, and wherein said sources of power are selected from at least one of: photovoltaic, solar thermal, wind power, hydroelectric, nuclear, geothermal, enhanced geothermal, ocean thermal, ocean wave, tidal power sources and carbon capture and sequestration enabled gasification or pyrolysis of coal or biomass.

Claim 4. A method according to any preceding claim, further comprising reacting carbon dioxide with minerals to form a carbonate or bicarbonate product.

Claim 5. A method according to any preceding claim, wherein carbon dioxide is introduced in the introducing step, and wherein the carbon dioxide is dissolved in aqueous solution.

Claim 6. A method according to any preceding claim, wherein molecular hydrogen acts as an electron donor and wherein hydrogen concentrations in air between 4 to 74.5% are avoided.

Claim 7. A method according to any preceding claim, whereby a culture broth is continuously removed from the environment suitable for maintaining chemoautotrophic organisms and flowed through membrane filters to separate the cell mass from the broth.

Claim 8. A method according to any preceding claim, wherein the biomass produced by the at least one chemosynthetic reaction is centrifuged and then dried with evaporation, and where the biomass produced is collected from dryers.

Claim 9. A method according to claim 7 or 8, where remaining water and nutrients separated from the biomass are pumped back into the environment suitable for maintaining chemoautotrophic organisms.