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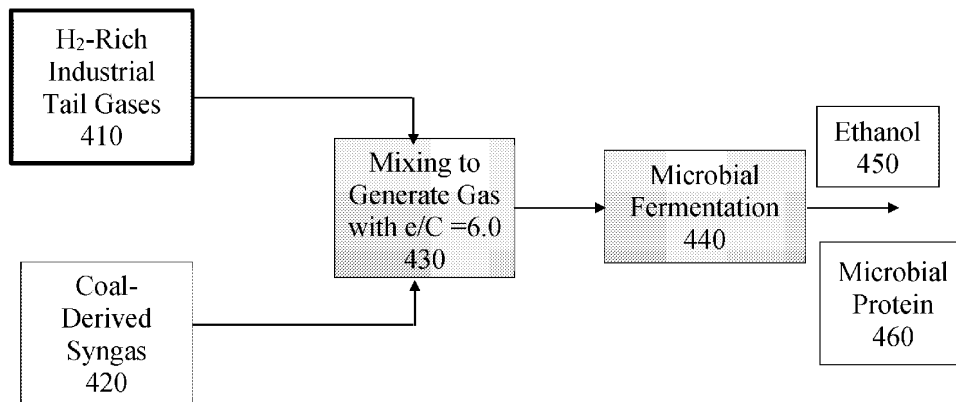


FIG. 4

(57) Abstract: "Green" methods of preparing oxygenated products, animal feed, and fertilizer are disclosed. Desired oxygenated products include, but are not limited to, ethanol, acetic acid, butyrate, butanol, propionate, propanol, or any combination thereof. The methods use synthesis gas (syngas), which can be produced from processing of coal, natural gas, and/or biomass. The syngas contains some combination of hydrogen, carbon monoxide, and/or carbon dioxide. The method entails blending the syngas with purge (tail) gases from industrial processes and/or with hydrogen gas, e.g., produced from renewable sources. The resulting mixture is a H₂-enriched syngas that is fermented by microorganisms that are well suited to ferment hydrogen-rich gases. Byproducts from the method can also be recovered. The disclosure also provides methods of preparing material fertilizer and animal feed, respectively. By repurposing purge gases so they are not emitted into the environment and/or using hydrogen from renewable sources, the disclosed methods are environmentally-friendly.

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