Summary

[0001] The concepts herein encompass production of chemical products from reactants circulated in a well, and in particular in a closed-loop well in a geothermal subterranean zone.

[0002] In certain aspects of the present disclosure, a geothermal reactor well system includes a closed-loop well coupled to one or more sources of reactants. The closed-loop well includes a first surface wellbore extending from a terranean surface to a geothermal subterranean zone and a second surface wellbore extending from the terrranean surface to the geothermal subterranean zone. A plurality of connecting wellbores connect the first surface wellbore to the second surface wellbore. A carrier fluid is disposed within the closed-loop well. The closed-loop well is configured so heat energy from the geothermal subterranean zone and/or reaction of reactants in the closed-loop well drives the fluids in the closed-loop well to circulate by thermosiphon and to thereby carry the reactants through the closed-loop well for the reaction and carry a product of the reaction through the closed-loop well for collection.

[0003] In certain aspects of the present disclosure, a method includes disposing reactants in a closed-loop well from one or more sources of reactants coupled thereto. The closed-loop well includes a first surface wellbore extending from a terranean surface to a geothermal subterranean zone and a second surface wellbore extending from a terranean surface to the geothermal subterranean zone. A plurality of connecting wellbores connect the first surface wellbore to the second surface wellbore. A carrier fluid is disposed within the closed-loop well. The carrier fluid is circulated to carry the reactants through the closed wellbore loop by thermosiphon from heat energy from the geothermal subterranean zone and/or reaction of reactants in the closed-loop well. The product from a reaction of the reactants is then collected from the closed-loop well.

The aspects above can include some, none or all of the following features. For example, in certain instances, the reaction is driven in part by heat energy from the geothermal subterranean zone. The closed wellbore loop can be configured such that a pressure and temperature within the closed wellbore loop are within a specified pressure and temperature range for the reaction. At least a portion of the connecting wellbores can be sealed against communication of fluids with the surrounding geothermal subterranean zone. The closed-loop well can include a catalyst bed disposed therein. The catalyst bed can include a slurry. The geothermal subterranean zone, in certain instances, has an inherent temperature of at least 200 degrees Celsius