What is claimed is:

1. A reactor system comprising:

a housing; and

at least one reactor cell disposed within an interior of the housing, the at least one reactor cell comprising an enclosure and a plasmonic photocatalyst on a catalyst support disposed within the at least one enclosure, wherein the enclosure is optically transparent and comprises at least one input for a reactant to enter the at least one cell and at least one output for a reformate to exit the at least one cell; and

at least one light source, wherein, upon application of the at least one light source, the reactor cell is configured to transform the reactant into the reformate.

2. The reactor system of claim 1, wherein the at least one light source is elongated and arranged coaxially along a central long axis of the housing.

3. The reactor system of claim 1, wherein the at least one light source is arranged coaxially within the housing and the at least one reactor cell comprises a plurality of reactor cells arranged surrounding the at least one light source.

4. The reactor system of claim 1, wherein the at least one light source comprises at least one light source selected from the group consisting of an LED, a metal halide bulb, a high pressure sodium bulb, a xenon lamp, an incandescent bulb, a fluorescent bulb, a halogen bulb, a HID lamp, and a laser.

5. The reactor system of claim 1, wherein each of the plurality of reactor cells comprises an enclosure having an outer cavity and a central cavity arranged coaxially with the outer cavity, wherein the outer cavity of each reactor cell contains the plasmonic photocatalyst on the catalyst support and the central cavity is configured to receive at least one of a light source or a thermal management feature.

6. The reactor system of claim 5, wherein the thermal management feature is at least one of a metal rod, metal wires, or a fluid thermal management system, and wherein the fluid thermal management system includes (a) a fluid input coupled to a first end of the central cavity of each reactor cell and (b) a fluid output coupled to a second end of the central cavity of each reactor cell, such that a supplied fluid may flow through each of the plurality of reactor cells to modify a temperature of the reactor system.

7. The reactor system of claim 1, further comprising:

a reactor fluid distributor connected to the at least one input of each reactor cell; and

a fluid accumulator connected to the at least one output of each reactor cell.

8. The reactor system of claim 1, further comprising one or more fittings coupling the at least one cell to at least one delivery channel for delivering the at least one reactant to or the at least one reformate from the enclosure of the at least one cell.

9. The reactor system of claim 1, wherein the at least one reactant is in fluid form.

10. A reactor system comprising:

a housing; and

at least one reactor cell disposed within an interior of the housing, the at least one reactor cell comprising an enclosure and a plasmonic photocatalyst on a catalyst support disposed within the at least one enclosure, wherein the enclosure is optically transparent and comprises at least one input for a reactant to enter the at least one cell and at least one output for a reformate to exit the at least one cell;

wherein, the reactor cell is configured, upon application of at least one light source, to transform the reactant into the reformate.

11. A method for transforming at least one reactant into at least one reformate, the method comprising:

distributing at least one reactant into a plurality of reactor cells disposed within a housing, wherein each reactor cell comprises an optically transparent enclosure and a plasmonic photocatalyst on a catalyst support disposed within the optically transparent enclosure;

illuminating, via at least one light source, an interior of the housing to cause the plurality of reactor cells to transform at least one reactant into at least one reformate; and

accumulating the at least one reformate from the plurality of reactor cells.

12. The method of claim 14, wherein the housing comprises a reflective interior surface, and wherein the method further comprises reflecting light from the at least one light source off of the reflective interior surface of the housing and into the plurality of reactor cells.

13. The method of claim 14, wherein the optically transparent enclosure of each of the plurality of reactor cells comprises an outer cavity and a central cavity arranged coaxially with the outer cavity, wherein the outer cavity of each reactor cell contains the plasmonic photocatalyst on the catalyst support and the central cavity of each reactor cell contains a

light source, and wherein the illuminating is from the light source contained in the central cavity of each of the plurality of reactor cells.

14. The method of claim 14, wherein the optically transparent enclosure of each of the plurality of reactor cells comprises an outer cavity and a central cavity arranged coaxially with the outer cavity, wherein the outer cavity of each reactor cell contains the plasmonic photocatalyst on the catalyst support and the central cavity of each reactor cell contains a thermal management feature, and wherein the method further comprises heating, via the thermal management feature in each of the plurality of reactor cells, the plurality of reactor cells to assist in transforming the at least one reactant into the at least one reformate.

15. The method of claim 17, wherein heating, the thermal management feature in each of the plurality of reactor cells, comprises supplying fluid from a fluid input coupled to a first end of the central cavity of each of the plurality of reactor cells to a fluid output coupled to a second end of the central cavity of each of the plurality of reactor cells, such that the fluid heats each of the plurality of reactor cells.

16. The method of claim 14, further comprising heating the plurality of reactor cells via the at least one reactant reacting with the plasmonic photocatalyst in each of the plurality of reactor cells.

17. The method of claim 14, wherein the at least one light source includes a light source external to the housing, wherein the housing is at least partially optically transparent, and wherein illuminating the interior of the housing includes directing electromagnetic radiation from the light source through the housing and into the plurality of photocatalytic reactor cells.

18. A reactor system comprising:

a housing;

a plurality of reactor cells disposed within the housing, each reactor cell comprising:

an enclosure having a reflective interior surface;

an input,

an output, and

a light source; and

at least one plasmonic photocatalyst on a catalyst support disposed within the enclosure, wherein the plasmonic photocatalyst comprises a catalyst coupled to a plasmonic material;

a distributor for distributing at least one reactant into the plurality of reactor cells via the input of each reactor cell; and

an accumulator for accumulating at least one reformate from the plurality of reactor cells via the output of each reactor cell.