[0005] Accordingly, there remains a need for improved, efficient, cost effective, and more versatile systems and processes that involve and can combine endothermic and exothermic reactions.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The accompanying drawings, which are incorporated into and constitute a part of this specification, show certain aspects of the subject matter disclosed herein and, together with the description, help explain some of the principles associated with the disclosed implementations. In the drawings:

[0007] FIG. 1 is a schematic illustration of an exemplary system for conversion of oxygenates where the first input feed includes at least ethanol; and

[0008] FIG. 2 is a schematic illustration of another exemplary system for conversion oxygenates where the first input feed includes at least methanol and ethanol.

[0009] When practical, similar reference numbers denote similar structures, features, or elements.

SUMMARY

[0010] In certain examples of the current subject matter, challenges associated with conversion of oxygenates can be addressed by inclusion of one or more of the features described herein or comparable/equivalent approaches as would be understood by one of ordinary skill in the art. Examples of the current subject matter relate to processes and systems for one or more oxygenates to one or more olefins.

[0011] In some examples, one or more of the following features may optionally be included in any feasible combination.

[0011a] In an aspect, there is provided a process for converting one or more oxygenates to one or more olefins, the process comprising:

introducing a first input feed into a first end of an adiabatic multistage reactor, the first input feed comprising one or more first oxygenates and one or more first olefins, the multistage reactor having at least a first reaction stage and a second reaction stage, wherein

the first reaction stage is upstream of the second reaction stage, and the first reaction stage having a first reactor bed, and the second reaction stage having a second reactor bed;

contacting the first input feed with the first reactor bed to thereby maintain a first temperature of the first reactor bed within a first temperature range from about 300 °C to 550 °C and to produce a first reaction mixture;

introducing a second input feed into the multistage reactor downstream of the first reaction stage such that, upon exiting the first reaction stage, the first reaction mixture is mixed with the second input feed to produce a first effluent having a different composition relative to the first reaction mixture, the second input feed comprising one or more second oxygenates; and

contacting the first effluent with the second reactor bed to thereby maintain a second temperature of the second reactor bed within a second temperature range from about 300 °C to 550 °C and to produce a second reaction mixture.

[0012] Exemplary processes for converting one or more oxygenates to one or more olefins are disclosed. In one exemplary example, the process includes introducing a first input feed into a first end of an adiabatic multistage reactor, the first input feed including one or more first oxygenates and one or more first olefins, the multistage reactor having at least a first reaction stage and a second reaction stage. The first reaction stage is upstream of the second reaction stage, and the first reaction stage has a first reactor bed, and the second

reaction stage has a second reactor bed. The process also includes contacting the first input feed with the first reactor bed to thereby maintain a first temperature of the first reactor bed within a first temperature range from about 300 °C to 550 °C and to produce a first reaction mixture, introducing a second input feed into the multistage reactor downstream of the first reaction stage such that, upon exiting the first reaction stage, the first reaction mixture is mixed with the second input feed to produce a first effluent having a different composition relative to the first reaction mixture, the second input feed including one or more second oxygenates. The process also includes contacting the first effluent with the second reactor bed to thereby maintain a second temperature of the second reactor bed within a second temperature range from about 300 °C to 550 °C and to produce a second reaction mixture.

[0013] In some examples, the multistage reactor can have a third reaction stage, the third reaction stage having a third reactor bed. In this case, the process can further include introducing a third input feed into the multistage reactor downstream of the second reaction stage such that, upon exiting the second reaction stage, the second reaction mixture can be mixed with the third input feed to produce a second effluent having a different composition relative to the second reaction mixture, the third input feed including one or more third oxygenates. The process also includes contacting the second effluent with the third reactor bed to thereby maintain a third temperature of the third reactor bed within a third temperature range from about 300 °C to 550 °C and to produce a third reaction mixture.

[0014] In some examples, during each reaction stage and between reaction stages, external heat is not added to the multistage reactor. In some examples, during each reaction stage and between reaction stages, heat is not removed from the multistage reactor. In some examples, the first effluent is not removed from the multistage reactor. In some examples, the second effluent is not removed from the multistage reactor. In some examples, heat is not removed from the first reaction mixture prior to being mixed with the second input feed. In some examples, heat is not removed from the second reaction mixture prior to being removed from the multistage reactor or subsequently mixed with the third input feed. In some examples, heat is not removed from the third reaction mixture prior to being removed from the multistage reactor or subsequently mixed with a fourth input feed.

[0015] In some examples, the one or more first oxygenates include a predominant first oxygenate, and the one or more first olefins includes a predominant first olefin, wherein

the predominant first oxygenate can be ethanol and the predominant first olefin can be ethylene.

In some examples, the molar ratio of ethylene : ethanol can be from about 0.25 to 10 in the first input feed. In some examples, the molar ratio of ethylene : ethanol can be from about 0.25 to 5 in the first input feed. In some examples, the first temperature range can be from about 350 °C to 500 °C. In some examples, the second temperature range can be from about 350 °C to 500 °C. In some examples, the third temperature range can be from about 350 °C to 500 °C.

[0016] In some examples, at least one of the first reactor bed or the second reactor bed can be a fixed bed. In some examples, the third reactor bed can be a fixed bed. In some examples, at least one of the first reactor bed or the second reactor bed can be a fluidized bed. In some examples, the third reactor bed can be a fluidized bed. In some examples, at least one of the first reactor bed or the second reactor bed can be a moving bed. In some examples, the third reactor bed can be a moving bed.

[0017] In some examples, the one or more first oxygenates and the one or more second oxygenates can be the same. In some examples, the one or more first oxygenates, the one or more second oxygenates, and the one or more third oxygenates can be the same. In some examples, the one or more first oxygenates include one or more C2+ alcohols. In some examples, the one or more second oxygenates include one or more C2+ alcohols. In some examples, the one or more third oxygenates include one or more C2+ alcohols.

[0018] In some examples, the one or more first oxygenates include a predominate first oxygenate, wherein the predominant oxygenate can be ethanol. In some examples, the one or more second oxygenates includes a second predominant oxygenate, wherein the predominant oxygenate can be ethanol. In some examples, the one or more third oxygenates include a predominant third oxygenate, wherein the predominant oxygenate can be ethanol.

[0019] In some examples, the process can further include introducing the second reaction mixture into a single stage reactor, the single stage reactor including one or more catalysts, and contacting the second reaction mixture with the one or more catalysts to produce an output stream including one or more product olefins. Prior to introducing the second reaction mixture into the single stage reactor, the process can include decreasing the temperature of the second reaction mixture.

[0020] In some examples, the process can further include introducing the output stream into a separation subsystem to produce a first stream and a second stream.

[0021] In some examples, the second stream can include at least one C3+ olefins. In some examples, the process can further include combining the first stream with the one or more first oxygenates to produce the first input feed. In some examples, the first stream can include a predominant olefin, wherein the predominant olefin can be ethylene.

[0022] In some examples, the process can further include condensing the output stream into a condensed output stream and introducing the condensed output stream into a separation subsystem to produce a first stream and a second stream. In some examples, the process can further include combining the first stream with the one or more first oxygenates to produce the first input feed. In some examples, the first stream can include a predominant olefin, wherein the predominant olefin can be ethylene. In some examples, the second stream can include at least one C3+ olefin.

[0023] In some examples, the process can further include introducing the third reaction mixture into a single stage reactor, the single stage reactor including one or more catalysts, and contacting the third reaction mixture with the one or more catalysts to produce an output stream including one or more product olefins.

[0024] In some examples, prior to introducing the third reaction mixture into the single stage reactor, the process can further include decreasing the temperature of the third reaction mixture. In some examples, the process can further include introducing the output stream into a separation system to produce a first stream and a second stream. In some examples, the process can further include combining the first stream with the one or more first oxygenates to produce the first input feed. In some examples, the first stream can include a predominant olefin, wherein the predominant olefin can be ethylene. In some examples, the second stream can include at least one C3+ olefin.

[0025] In some examples, the process can further include condensing the output stream into a condensed output stream and introducing the condensed reaction mixture into a separation subsystem to produce a first stream and a second stream. In some examples, the process can further include combining the first stream with the one or more first oxygenates to produce the first input feed. In some examples, the first stream can include a predominant olefin, wherein the predominant olefin can be ethylene. In some examples, the second stream can include at least one C3+ olefin.

[0026] In some examples, prior to introducing the first input stream into the adiabatic multistage reactor, the process can further include superheating the one or more first oxygenates. In some examples, prior to introducing the second input stream into the adiabatic multistage reactor, the process can further include superheating the one or more second oxygenates. In some examples, prior to introducing the third input stream into the adiabatic multistage reactor, the process can further include superheating the one or more third oxygenates.

[0027] In some examples, the multistage reactor can be at a gauge pressure from 0 to about 30 bar. In some examples, the multistage reactor can be at a weight hourly space velocity (WHSV) from about 0.25 to 15.

[0028] In some examples, at least one of the first reactor bed or the second reactor bed can include a mixture of catalysts. In some examples, the mixture of catalysts can include a zeolite and an alcohol dehydration catalyst. In some examples, the third reactor bed can include a mixture of catalysts. In some examples, the mixture of catalysts of the third reactor bed can include a zeolite and an alcohol dehydration catalyst.

[0029] In some examples, the second input feed can be introduced into the adiabatic multistage reactor at a temperature that can be greater than a temperature of the first reaction mixture. In some examples, the third input feed can be introduced into the adiabatic multistage reactor at a temperature that can be greater than a temperature of the second reaction mixture.

[0030] In some examples, the multistage reactor can include one or more additional reaction stages downstream of the third reaction stage, the one or more additional reaction stages each having a respective reactor bed. In this case the process can further include introducing a subsequent input feed into the multistage reactor downstream of prior reaction stages such that, upon exiting the prior reaction stage, a prior reaction mixture can be mixed with the subsequent input feed to produce an additional effluent having a different composition than the prior reaction mixture, the subsequent input feed including one or more additional oxygenates. The process can also include contacting the prior effluent with the respective reactor bed of one of the one of more additional reaction stages to thereby maintain a temperature of the respective reactor bed within a temperature range from about

300 °C to 550 °C and to produce an additional reaction mixture downstream of the prior reaction stages.

[0031] In some examples, the one or more first oxygenates can include ethanol and methanol. In some examples, the one or more first olefins can include ethylene, propylene, butene, or any combination thereof.

[0032] In some examples, the one or more first oxygenates do not include methanol. In some examples, the one or more second oxygenates do not include methanol. In some examples, the one or more third oxygenates do not include methanol.

[0032a] In another aspect, there is provided a process for converting one or more oxygenates to one or more olefins, the process comprising:

introducing a first input feed into a first end of an adiabatic multistage reactor, the first input feed comprising one or more first oxygenates, the one or more first oxygenates comprising ethanol and at least one of methanol or dimethylether, the multistage reactor having at least a first reaction stage and a second reaction stage, wherein the first reaction stage is upstream of the second reaction stage, and the first reaction stage having a first reactor bed, and the second reaction stage having a second reactor bed;

contacting the first input feed with the first reactor bed to thereby maintain a first temperature of the first reactor bed within a first temperature range from about 300 °C to 550 °C and to produce a first reaction mixture;

introducing a second input feed into the multistage reactor downstream of the first reaction stage such that, upon exiting the first reaction stage, the first reaction mixture is mixed with the second input feed to produce a first effluent having a different composition relative to the first reaction mixture, the second input feed comprising one or more second oxygenates; and

contacting the first effluent with the second reactor bed to thereby maintain a second temperature of the second reactor bed within a second temperature range from about 300 °C to 550 °C and to produce a second reaction mixture.

[0033] In another example, another process for converting one or more oxygenates to one or more olefins is provided. In some examples, the process includes introducing a first input feed into a first end of an adiabatic multistage reactor, the first input feed includes one or more first oxygenates, the one or more first oxygenates include ethanol and at least one of methanol or dimethylether, the multistage reactor has at least a first reaction stage and a second reaction stage, wherein the first reaction stage is upstream of the second reaction stage, and the first reaction stage has a first reactor bed, and the second reaction

stage has a second reactor bed. The process also includes contacting the first input feed with the first reactor bed to thereby maintain a first temperature of the first reactor bed within a first temperature range from about 300 °C to 550 °C and to produce a first reaction mixture and introducing a second input feed into the multistage reactor downstream of the first reaction stage such that, upon exiting the first reaction stage, the first reaction mixture is mixed with the second input feed to produce a first effluent having a different composition relative to the first reaction mixture, the second input feed includes one or more second oxygenates. The process further includes contacting the first effluent with the second reactor bed to thereby maintain a second temperature of the second reactor bed within a second temperature range from about 300 °C to 550 °C and to produce a second reaction mixture.

[0034] In some examples, the multistage reactor can have a third reaction stage having a third reactor bed and the process can further include introducing a third input feed into the multistage reactor downstream of the second reaction stage such that, upon exiting the second reaction stage, the second reaction mixture can be mixed with the third input feed to produce a second effluent having a different composition relative to the second reaction mixture, the third input feed including one or more third oxygenates. The process can also include contacting the second effluent with the third reactor bed to thereby maintain a third temperature of the third reactor bed within a third temperature range from about 300 °C to 550 °C and to produce a third reaction mixture.In some examples, the one or more first

oxygenates can include ethanol and methanol. In some examples, the one or more first oxygenates can include ethanol or dimethylether. In such examples, the one or more first oxygenates can further include methanol.

[0035] In some examples, the one or more second oxygenates can include ethanol, methanol, or a combination thereof. In some examples, one or more second oxygenates do not include methanol.

[0036] In some examples, the one or more third oxygenates can include ethanol, methanol, or a combination thereof. In some examples, the one or more third oxygenates do not include methanol.

[0036a] In another aspect, there is provided a system comprising the adiabatic multistage reactor as defined above.

[0037] In another example, a system arranged to convert one or more oxygenates to one or more olefins using the processes described above is provided. In some examples, the system can include the adiabatic multistage reactor described above.

[0037a] In another aspect, there is provided a process for converting one or more oxygenates to one or more olefins, the process comprising:

introducing a first input feed into a first end of adiabatic multistage reactor assembly, the first input feed comprising one or more first oxygenates and at least one or more first olefins and methanol, the multistage reactor assembly having at least a first reaction stage and a second reaction stage, wherein the first reaction stage is upstream of the second reaction stage, and the first reaction stage having a first reactor bed, and the second reaction stage having a second reactor bed;

contacting the first input feed with the first reactor bed to thereby maintain a first temperature of the first reactor bed within a first temperature range from about 300 °C to 550 °C and to produce a first reaction mixture;

introducing a second input feed into the multistage reactor assembly downstream of the first reaction stage such that, upon exiting the first reaction stage, the first reaction mixture is mixed with the second input feed to produce a first effluent having a different composition relative to the first reaction mixture, the second input feed comprising one or more second oxygenates; and

contacting the first effluent with the second reactor bed to thereby maintain a second temperature of the second reactor bed within a second temperature range from about 300 °C to 550 °C and to produce a second reaction mixture.

[0038] In another example, a process for converting one or more oxygenates to one or more can include a first input feed into a first end of adiabatic multistage reactor assembly, the first input feed can include one or more first oxygenates and at least one or more first olefins and methanol, where the multistage reactor assembly has at least a first reaction stage and a second reaction stage, and the first reaction stage is upstream of the second reaction stage. The first reaction stage has a first reactor bed, and the second reaction stage has a second reactor bed. The process also includes contacting the first input feed with the first reactor bed to thereby maintain a first temperature of the first reactor bed within a first temperature range from about 300 °C to 550 °C and to produce a first reaction mixture, and introducing a second input feed into the multistage reactor assembly downstream of the first reaction stage such that, upon exiting the first reaction stage, the first reaction mixture is mixed with the second input feed to produce a first effluent having a different composition relative to the first reaction mixture. The second input feed includes one or more second oxygenates. The process also includes contacting the first effluent with the second reactor bed to thereby maintain a second temperature of the second reactor bed within a second temperature range from about 300 °C to 550 °C and to produce a second reaction mixture.

[0039] In some examples, the multistage reactor assembly can have a third reaction stage, where the third reaction stage has a third reactor bed. In such examples, the process can include introducing a third input feed into the multistage reactor assembly downstream of the second

reaction stage such that, upon exiting the second reaction stage, the second reaction mixture can be mixed with the third input feed to produce a second effluent that can have a different composition relative to the second reaction mixture. The third input feed can include one or more third oxygenates. The process can also include contacting the second effluent with the third reactor bed to thereby maintain a third temperature of the third reactor bed within a third temperature range from about 300 °C to 550 °C and to produce a third reaction mixture.

[0040] In some examples, the multistage reactor assembly can include two or more reactors, in which the first and second stages can be carried in the first reactor and the third stage can be carried out in the second reactor.

[0041] In some examples, the multistage reactor assembly can include two or more reactors, in which the first reactor bed can be located in a first reactor and the second reactor bed can be located in a second reactor. In such examples, the third reactor bed can be located in a third reactor.

[0042] In some examples, the first input feed can include one or more first oxygenates, one or more first olefins, and methanol.

[0043] In some examples, the first input feed can include one or more first oxygenates and methanol.

[0044] In some examples, the first input feed can include one or more first oxygenates and one or more first olefins.

[0045] In some examples, the one or more second oxygenates do not include methanol.

[0046] In some examples, the one or more third oxygenates do not include methanol.

[0047] In some examples, the one or more first olefins can include one or more recycled olefins, in which the one or more recycled olefins can include ethylene, propylene, butenes, pentenes, or any combination thereof.

DETAILED DESCRIPTION

[0048] Certain exemplary aspects will now be described to provide an overall understanding of the principles of the structure, function, manufacture, and use of the systems and processes disclosed herein. One or more examples of these aspects are illustrated in the

WHAT IS CLAIMED IS:

1. A process for converting one or more oxygenates to one or more olefins, the process comprising:

introducing a first input feed into a first end of an adiabatic multistage reactor, the first input feed comprising one or more first oxygenates and one or more first olefins, the multistage reactor having at least a first reaction stage and a second reaction stage, wherein the first reaction stage is upstream of the second reaction stage, and the first reaction stage having a first reactor bed, and the second reaction stage having a second reactor bed;

contacting the first input feed with the first reactor bed to thereby maintain a first temperature of the first reactor bed within a first temperature range from about 300 °C to 550 °C and to produce a first reaction mixture;

introducing a second input feed into the multistage reactor downstream of the first reaction stage such that, upon exiting the first reaction stage, the first reaction mixture is mixed with the second input feed to produce a first effluent having a different composition relative to the first reaction mixture, the second input feed comprising one or more second oxygenates; and

contacting the first effluent with the second reactor bed to thereby maintain a second temperature of the second reactor bed within a second temperature range from about 300 °C to 550 °C and to produce a second reaction mixture.

2. The process of claim 1, wherein the multistage reactor has a third reaction stage, the third reaction stage having a third reactor bed, the process further comprising,

introducing a third input feed into the multistage reactor downstream of the second reaction stage such that, upon exiting the second reaction stage, the second reaction mixture is mixed with the third input feed to produce a second effluent having a different composition relative to the second reaction mixture, the third input feed comprising one or more third oxygenates; and

contacting the second effluent with the third reactor bed to thereby maintain a third temperature of the third reactor bed within a third temperature range from about 300 °C to 550 °C and to produce a third reaction mixture.

3. The process of claims 1 or 2, wherein, during each reaction stage and between reaction stages, external heat is not added to the multistage reactor, or wherein, during each reaction

stage and between reaction stages, heat is not removed from the multistage reactor, and/or wherein the first effluent is not removed from the multistage reactor, and/or wherein the second effluent is not removed from the multistage reactor, and/or wherein heat is not removed from the first reaction mixture prior to being mixed with the second input feed and/or wherein heat is not removed from the second reaction mixture prior to being removed from the multistage reactor or subsequently mixed with the third input feed.

4. The process of claims 2 or 3, wherein heat is not removed from the third reaction mixture prior to being removed from the multistage reactor or subsequently mixed with a fourth input feed.

5. The process of any one of claims 1 to 4, wherein the one or more first oxygenates comprises a predominant first oxygenate, and the one or more first olefins comprises a predominant first olefin, wherein the predominant first oxygenate is ethanol and the predominant first olefin is ethylene, preferably wherein the molar ratio of ethylene : ethanol is from about 0.25 to 10 in the first input feed, more preferably wherein the molar ratio of ethylene : ethanol is from about 0.25 to 5 in the first input feed, and/or wherein the first temperature range is from about 350 °C to 500 °C, and/or wherein the second temperature range is from about 350 °C to 500 °C.

6. The process of any one of claims 2 to 5, wherein the third temperature range is from about 350 °C to 500 °C.

7. The process of any one of claims 1 to 6, wherein at least one of the first reactor bed or the second reactor bed is a fixed bed, or wherein at least one of the first reactor bed or the second reactor bed is a fluidized bed, or wherein at least one of the first reactor bed or the second reactor bed is a moving bed.

8. The process of any one of claims 2 to 7, wherein the third reactor bed is a fixed bed.

9. The process of any one of claims 2 to 6, wherein the third reactor bed is a fluidized bed, or wherein the third reactor bed is a moving bed.

10. The process of any one of claims 1 to 9, wherein the one or more first oxygenates and the one or more second oxygenates are the same, and/or wherein the one or more first oxygenates comprise one or more C2+ alcohols, and/or wherein the one or more second oxygenates

comprise one or more C2+ alcohols, and/or wherein the one or more first oxygenates comprise a predominate first oxygenate, preferably wherein the predominant oxygenate is ethanol, and/or wherein the one or more second oxygenates comprises a second predominant oxygenate, preferably wherein the predominant oxygenate is ethanol.

11. The process of any one of claims 2 to 10, wherein the one or more first oxygenates, the one or more second oxygenates, and the one or more third oxygenates are the same, and/or wherein the one or more third oxygenates comprise one or more C2+ alcohols, and/or wherein the one or more third oxygenates comprise a predominant third oxygenate, preferably wherein the predominant oxygenate is ethanol.

12. The process of any one of claims 1 or 3 to 11, further comprising introducing the second reaction mixture into a single stage reactor, the single stage reactor comprising one or more catalysts, and contacting the second reaction mixture with the one or more catalysts to produce an output stream comprising one or more product olefins, or further comprising, prior to introducing the second reaction mixture into the single stage reactor, decreasing the temperature of the second reaction mixture, and/or further comprising introducing the output stream into a separation subsystem to produce a first stream and a second stream, or wherein the second stream comprises at least one C3+ olefins, preferably combining the first stream with the one or more first oxygenates to produce the first input feed, or wherein the first stream comprises a predominant olefin, wherein the predominant olefin is ethylene, and/or further comprising condensing the output stream into a condensed output stream and introducing the condensed output stream into a separation subsystem to produce a first stream and a second stream, preferably combining the first stream with the one or more first oxygenates to produce the first input feed., or wherein the first stream comprises a predominant olefin, wherein the predominant olefin is ethylene, or wherein the second stream comprises at least one C3+ olefin.

13. The process of any one of claims 2 to 11, further comprising introducing the third reaction mixture into a single stage reactor, the single stage reactor comprising one or more catalysts, and contacting the third reaction mixture with the one or more catalysts to produce an output stream comprising one or more product olefins, or further comprising, prior to introducing the third reaction mixture into the single stage reactor, decreasing the temperature of the third reaction mixture, and/or further comprising introducing the output stream into a separation system to produce a first stream and a second stream, preferably combining the

first stream with the one or more first oxygenates to produce the first input feed, and/or wherein the first stream comprises a predominant olefin, wherein the predominant olefin is ethylene., and/or wherein the second stream comprises at least one C3+ olefins, and/or further comprising condensing the output stream into a condensed output stream and introducing the condensed reaction mixture into a separation subsystem to produce a first stream and a second stream, preferably combining the first stream with the one or more first oxygenates to produce the first input feed, and/or wherein the first stream comprises a predominant olefin, wherein the predominant olefin is ethylene, and/or wherein the second stream comprises at least one C3+ olefins.

14. The process of any one of claims 1 to 13, further comprising, prior to introducing the first input stream into the adiabatic multistage reactor, heating the one or more first oxygenates, and/or further comprising, prior to introducing the second input stream into the adiabatic multistage reactor, heating the one or more second oxygenates, and/or wherein the multistage reactor is at a gauge pressure from 0 to about 30 bar, and/or wherein the multistage reactor is at a weight hourly space velocity (WHSV) from about 0.25 to 15, and/or wherein at least one of the first reactor bed or the second reactor bed comprises a mixture of catalysts, preferably wherein the mixture of catalysts comprises a zeolite and an alcohol dehydration catalyst, and/or wherein the second input feed is introduced into the adiabatic multistage reactor at a temperature that is greater than a temperature of the first reaction mixture, and/or wherein the one or more first oxygenates comprise ethanol and methanol.

15. The process of any one of claims 2 to 14, further comprising, prior to introducing the third input stream into the adiabatic multistage reactor, heating the one or more third oxygenates, and/or wherein the third reactor bed comprises a mixture of catalysts, preferably wherein the mixture of catalysts of the third reactor bed comprises a zeolite and an alcohol dehydration catalyst, and/or wherein the third input feed is introduced into the adiabatic multistage reactor at a temperature that is greater than a temperature of the second reaction mixture,

and/or wherein the multistage reactor comprises one or more additional reaction stages downstream of the third reaction stage, the one or more additional reaction stages each having a respective reactor bed, the process further comprising,

introducing a subsequent input feed into the multistage reactor downstream of prior reaction stages such that, upon exiting the prior reaction stage, a prior reaction mixture is mixed with the subsequent input feed to produce an additional effluent having a different composition than the prior reaction mixture, the subsequent input feed comprising one or more additional oxygenates; and

contacting the prior effluent with the respective reactor bed of one of the one of more additional reaction stages to thereby maintain a temperature of the respective reactor bed within a temperature range from about 300 °C to 550 °C and to produce an additional reaction mixture downstream of the prior reaction stages.

16. The process of any one of claims 1 to 15, wherein the one or more first olefins comprise ethylene, propylene, butene, or any combination thereof, and/or wherein the one or more first oxygenates do not comprise methanol, and/or wherein the one or more second oxygenates do not comprise methanol, and/or wherein the one or more third oxygenates do not comprise methanol.

17. A process for converting one or more oxygenates to one or more olefins, the process comprising:

introducing a first input feed into a first end of an adiabatic multistage reactor, the first input feed comprising one or more first oxygenates, the one or more first oxygenates comprising ethanol and at least one of methanol or dimethylether, the multistage reactor having at least a first reaction stage and a second reaction stage, wherein the first reaction stage is upstream of the second reaction stage, and the first reaction stage having a first reactor bed, and the second reaction stage having a second reactor bed;

contacting the first input feed with the first reactor bed to thereby maintain a first temperature of the first reactor bed within a first temperature range from about 300 °C to 550 °C and to produce a first reaction mixture;

introducing a second input feed into the multistage reactor downstream of the first reaction stage such that, upon exiting the first reaction stage, the first reaction mixture is mixed with the second input feed to produce a first effluent having a different composition relative to the first reaction mixture, the second input feed comprising one or more second oxygenates; and

contacting the first effluent with the second reactor bed to thereby maintain a second temperature of the second reactor bed within a second temperature range from about 300 °C to 550 °C and to produce a second reaction mixture.

18. The process of claim 17, wherein the multistage reactor has a third reaction stage, the third reaction stage having a third reactor bed, the process further comprising,

introducing a third input feed into the multistage reactor downstream of the second reaction stage such that, upon exiting the second reaction stage, the second reaction mixture is mixed with the third input feed to produce a second effluent having a different composition relative to the second reaction mixture, the third input feed comprising one or more third oxygenates; and

contacting the second effluent with the third reactor bed to thereby maintain a third temperature of the third reactor bed within a third temperature range from about 300 °C to 550 °C and to produce a third reaction mixture.

19. The process of claims 17 or 18, wherein the one or more first oxygenates comprise ethanol and methanol, or wherein the one or more first oxygenates comprise ethanol or dimethylether, preferably wherein the one or more first oxygenates further comprise methanol, and/or wherein the one or more second oxygenates comprises ethanol, methanol, or a combination thereof, and/or wherein the one or more second oxygenates do not comprise methanol, and/or wherein the one or more third oxygenates comprises ethanol, methanol, or a combination thereof, and/or wherein the one or more third oxygenates do not comprise methanol.

20. A system comprising the adiabatic multistage reactor of any one of claims 1 to 19.

21. A process for converting one or more oxygenates to one or more olefins, the process comprising:

introducing a first input feed into a first end of adiabatic multistage reactor assembly, the first input feed comprising one or more first oxygenates and at least one or more first olefins and methanol, the multistage reactor assembly having at least a first reaction stage and a second reaction stage, wherein the first reaction stage is upstream of the second reaction stage, and the first reaction stage having a first reactor bed, and the second reaction stage having a second reactor bed;

contacting the first input feed with the first reactor bed to thereby maintain a first temperature of the first reactor bed within a first temperature range from about 300 °C to 550 °C and to produce a first reaction mixture;

introducing a second input feed into the multistage reactor assembly downstream of the first reaction stage such that, upon exiting the first reaction stage, the first reaction mixture is mixed with the second input feed to produce a first effluent having a different composition relative to the first reaction mixture, the second input feed comprising one or more second oxygenates; and

contacting the first effluent with the second reactor bed to thereby maintain a second temperature of the second reactor bed within a second temperature range from about 300 °C to 550 °C and to produce a second reaction mixture.

22. The process of claim 21, wherein the multistage reactor assembly has a third reaction stage, the third reaction stage having a third reactor bed, the process further comprising,

introducing a third input feed into the multistage reactor assembly downstream of the second reaction stage such that, upon exiting the second reaction stage, the second reaction mixture is mixed with the third input feed to produce a second effluent having a different composition relative to the second reaction mixture, the third input feed comprising one or more third oxygenates; and

contacting the second effluent with the third reactor bed to thereby maintain a third temperature of the third reactor bed within a third temperature range from about 300 °C to 550 °C and to produce a third reaction mixture.

23. The process of claims 21 or 22, wherein the multistage reactor assembly includes two or more reactors, wherein the first and second stages are carried in the first reactor and the third stage is carried out in the second reactor, or wherein the multistage reactor assembly includes two or more reactors, wherein the first reactor bed is located in a first reactor and the second reactor bed is located in a second reactor, preferably wherein the third reactor bed is located in a third reactor, and/or wherein the first input feed comprises one or more first oxygenates, one or more first olefins, and methanol, and/or wherein the first input feed comprises one or more first oxygenates and methanol, and/or wherein the first input feed comprises one or more first oxygenates and one or more first olefins, and/or wherein the one or more second oxygenates do not comprise methanol, and/or wherein the one or more third oxygenates do not comprise methanol.

24. The process of any one of the preceding claims, wherein the one or more first olefins comprise one or more recycled olefins, wherein the one or more recycled olefins comprise ethylene, propylene, butenes, pentenes, or any combination thereof.